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## THE MANUFACTURE OF PLASTER OF PARIS.

BY J. P. OSBNER, M. A.

Gypsum is a mineral, very widely and abundantly disseminated, whether as the snow white, translucent, and massive alabaster, the transparent, crystallized selenite, the fiberous, beautiful satin spar, or the ordinary amorphous, rather soft plaster stone. It is only when ground and calcined that the term plaster of Paris is applied to it, from the great extent of gypsum existing at Montmartre, near Paris, where it has been worked for a long time.

The many beautiful objects of art into which alabaster is formed, such as vases, monuments in churches, statues, etc., are familiar enough to many. The softness of the stone, and its rapid deterioration when exposed to the weather, render it adapted only for statuettes and other small works of art, or for those which are not intended to be exposed to excessive moisture or climatic influences.

The crystallized and transparent form of gypsum, frequently found in large deposits of the ordinary stone, is known as selenite, from *selene*, the moon, on account of its reflecting a soft moon-like luster. This variety is capable of splitting up into thin laminæ or leaves, sometimes of large size.

The beautiful satin spar is a fiberous variety of gypsum, and exhibits a fine play of light, like lustrous satin. It is used for necklaces, inlaid work, and other ornamental purposes, though it is easily scratched and its beauty destroyed. Anhydrite is the term applied to a hard compact variety, which is remarkable from the fact of its containing no water; it is consequently inapplicable, as will be seen more clearly presently, for the process and uses which we are about to describe.

Fig. 2.

The ordinary amorphous form of gypsum, or plaster stone, of which we have to treat in this article, is a sulphate of lime, containing, in 100 parts, 46·51 parts sulphuric acid, 32·56 parts of lime, and 20·93 parts of water. It is the peculiar way in which this water is held, its easy expulsion by a moderate heat, and the subsequent readiness of the material to combine with the abstracted water, when again presented to it, and assume the solid state, that give to gypsum its importance in the useful arts, and make its manufacture on the large scale a great and increasing industry.

In its composition will be noted how substances, highly corrosive in themselves, sometimes unite to form inert and harmless compounds. Confectioners largely adulterate their sugar plums with very finely ground or elutriated gypsum.

Gypsum, in the ordinary state, as largely quarried, resembles good limestone or carbonate of lime; but it differs from it in not, when pure, effervescing with acids and in being softer. It is indeed unattacked by acids; but by the action of water it is gradually dissolved and washed away, 1 part requiring 400 parts of water for its solution.

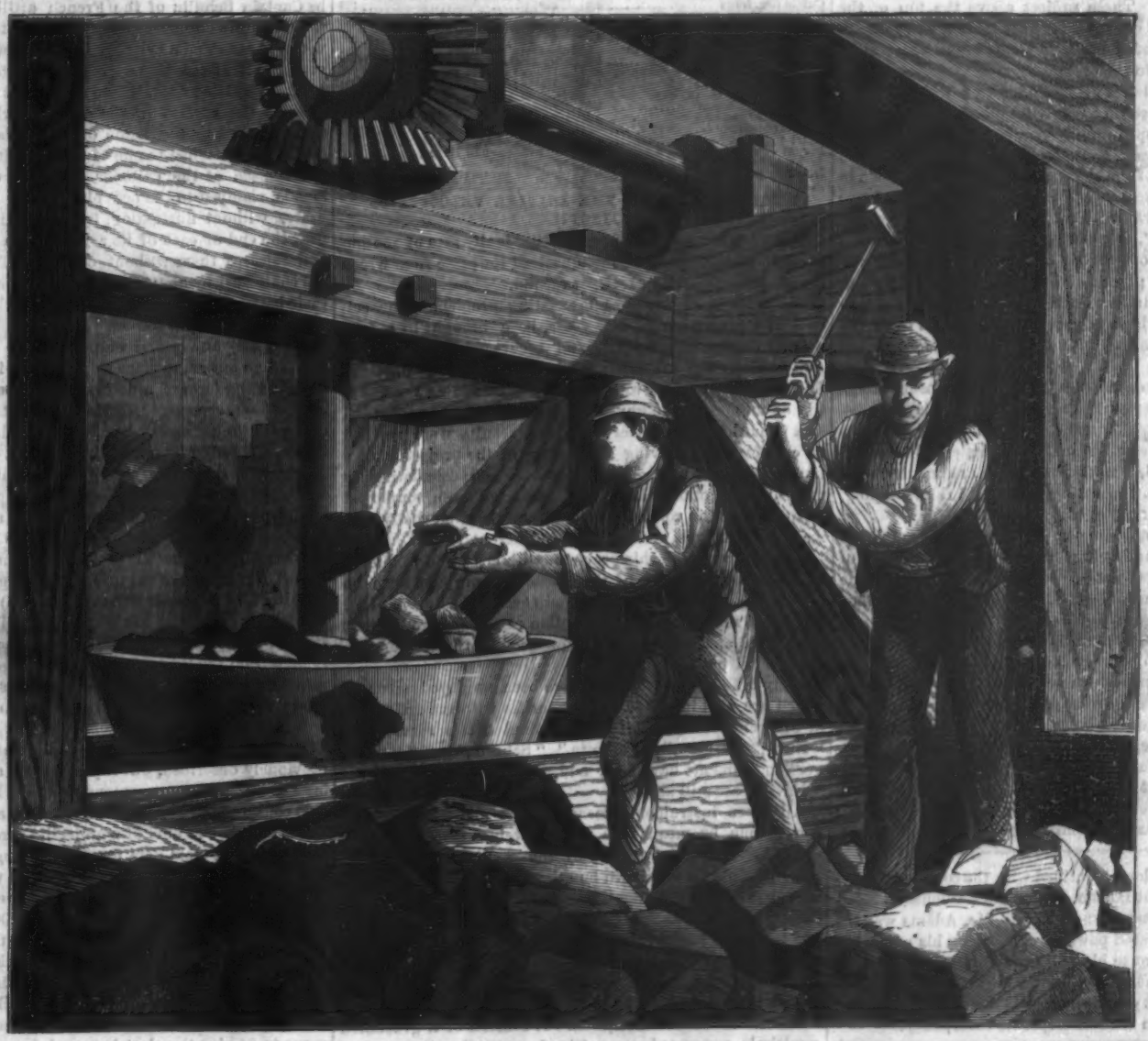
When crude gypsum in any of its forms, except anhydrite, is heated to 212° Fah., it begins to lose its combined water, and parts with it entirely at 272° Fah. If it be now withdrawn from the source of heat and, in a powdered condition, mixed with water, it combines with the same quantity previously expelled, and sets or becomes solid as at first. The operation of driving off this combined water is termed calcination.

We come now to the processes connected with the treatment of gypsum for rendering it available for the arts. The principal treatment, on which everything may be said to depend, is the calcination, or the exposing of the stone to that degree of heat which is just sufficient to expel enough water, so that the powdered material, when mixed with water, will set rapidly into a solid mass. This can be effected in two ways, either by exposing the hard crude stone, in small lumps, to the direct action of flame, or by submitting the crude powdered material to an indirect source of heat. The first method is practiced in Europe, where the crude gypsum is burned in kilns, similar to those used for lime, or sometimes in those of more improved construction, but in which the stone is still exposed to a direct fire.

The disadvantages attending this method are that the lower layers of stone are "dead burnt," so that their powder will not set with water, and the upper layers are apt to be insufficiently dehydrated, giving rise to the same evil. Many pieces of gypsum, moreover, when taken from the kiln, are found to contain a core of raw plaster, which of course is incapable of setting solid. After calcination, the stone found to be sufficiently burnt is powdered and packed for use.

The great demand for calcined plaster, and its cheapness for building purposes, have caused large steam mills to supersede the old-fashioned method of manufacture.

By the kindness of Messrs. Wotherspoon Brothers, proprietors of the Phœnix Plaster Mills, in West Thirteenth street, New York city, our artist has been enabled to make a series of drawings which will help to explain the various processes of the manufacture. The large illustration (Fig. 1) shows the operation of breaking and crushing.



THE MANUFACTURE OF PLASTER OF PARIS.

The crude gypsum which, when brought to the mill, is in masses weighing from 20 to 100 lbs. or over, is broken up by the hammer into pieces rather smaller than an ordinary paving stone, and thrown by the workman into the crusher. This consists of an upright shaft expanding below into heavy iron cogs, which turn in an exterior iron shell, as seen in Fig. 1. The stone is here rapidly reduced to powder, but not yet sufficiently fine for the calcining process. A pulley below conducts the powdered material, by means of cleats revolving in an inclined wooden pipe, termed a conveyer, to the floor above. This style of conveyer is used in flour mills, and is located on the left of the crusher in the engraving. Here the crushed plaster is fed by a hopper, like wheat, to a burr stone mill, which reduces it to a fine powder, ready for the calcining process. Another conveyer, similar to the one described, carries the fine raw plaster to a bin at the top of the

Fig. 3.

building, where it is delivered in successive charges to the kettles. These, as shown in the illustration (Fig. 2), consist of large cast iron receptacles, capable of holding 45 barrels as a charge. They are set in brick furnaces and their bot-

toms are constructed in a peculiar manner and of stout iron, to withstand the heat of an anthracite fire. Revolving stirrers, almost in contact with the bottoms and sides, are kept in motion to prevent caking.

Care and skill are requisite in the calcination process, to avoid either over or under burning. If all the water be driven off, the plaster will not harden so rapidly as that which has been heated so long as the tumultuous expulsion of vapor lasts; and if only half the contained water be expelled, the plaster will have entirely lost its power of hardening with water. Properly calcined gypsum seems to retain one fourth of its combined water. When the calciner judges the process to be complete, the calcined plaster is drawn out into a bin, where it is conducted to the bolt, which is a revolving cylindrical drum made up of three different finenesses of wire cloth set on an incline. The finest sieve is first encountered, and then the material falls upon the others in turn. Directly below, corresponding to the width of each particular fineness of the sieve, are bins which receive the calcined plaster of three degrees of fineness, known as superfine, casting, and common. From these bins the article is rapidly shoveled into barrels and packed for the trade.

The method of packing is seen in the illustration, Fig. 3. The workman first prepares the barrel by lining its interior by hand with a few sheets of brown paper, wide enough to overlap one another. These project above the top of the barrel, and are folded over in a very secure manner, thus answering the purpose of a head. Barrels for distant transportation are headed in the ordinary manner.

The barrel to be filled is first fitted with a wide mouthed funnel, and then placed on a revolving platform, and, while rotating slowly, is tapped rapidly by a hammer actuated by a spring and ratchet wheel. Each shovelful is thus well packed.

This manufactory of the Messrs. Wotherspoon has been in operation over forty years, and utilizes the product of two quarries, one at Wentworth, near Windsor, Nova Scotia, and the other at Hillsboro', New Brunswick. The establishment is capable of turning out about 2,000 barrels per week.

Among the uses of plaster of Paris may be noted its employment for a hard finish to walls and the molding of cornice ornaments, for which purpose, to prevent its too rapid setting, it is usually mixed with a due proportion of slaked lime.

A remarkable fact connected with calcined gypsum is that the addition of two per cent of alum or borax delays its setting three or four hours, but the material then becomes a stone-like body, heavier than ordinary plaster. In Germany, Italy and England, beautiful cements are made in this way, known as parian. In taking casts, and in stereotyping, plaster of Paris is largely used.

Besides its use for molds in potteries, gypsum is employed for glazing porcelain; and, being an excellent non-conductor of heat, for filling fireproof safes. In Spain and France, made into a mortar with sand and quicklime, it is used for cementing floors and vaults.

In the United States, gypsum is extensively used as a fertilizer, and is found to be very efficacious on some soils. It is used as a top dressing for grasses, and for potatoes and turnips, but the grains do not require it. Liebig has pointed out the fact that it fixes the ammonia of the soil as well as that of the atmosphere, thus conveying nitrogen to the roots.

The best gypsum quarries that are worked on this continent are on the Bay of Fundy, Nova Scotia, and Hillsboro', New Brunswick. Over one hundred thousand tuns of the finest quality are annually imported into the United States.

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MR. SETH ADAMS, long identified with the commercial and mechanical interests of Boston, died at his residence in Newton a few days ago after a long illness. Mr. Adams was the inventor of the celebrated power press bearing his name, but left it for improvement to his brother Isaac, who afterward became celebrated among printers for his many contrivances for facilitating the art of printing. He had a large property, which was invested in various corporate enterprises.

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### PUBLISHERS' CARD.

With this issue of our journal, the time for which a large number of our subscribers have prepaid will expire. In order that our readers may experience no stoppage in the receipt of the journal, and that we may not miscalculate the quantity of the paper to print at the commencement of a new volume, we hope our friends will signify their intention to continue the paper by early remittances.

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## MEASUREMENT OF THE INITIAL VELOCITY OF PROJECTILES.

The initial velocity of a projectile is its rate of motion through the air, at or near the muzzle of the piece from which it is fired, expressed in feet per second.

The solution of this most interesting problem in the science of gunnery has, of late years, been brought to a surprising degree of simplicity and accuracy by the application of electricity to instruments designed for the purpose. Formerly the problem was solved by determining the quantity of motion of the gun with its charge, etc., suspended as a pendulum, and, afterwards, the results were verified or corrected by receiving the impact of the projectile on a butt, suspended also on a pendulum, and calculating its quantity of motion. Both methods have been employed separately and in conjunction, but they required costly permanent structures, and gave but indifferent results.

The importance of this problem, without a knowledge of which no true estimate of the effects of a projectile can be formed, led to the search for a more accurate solution of it, which has resulted in the production of the electro-ballistic pendulum and chronoscopes now used by the artillery experts of all nations.

Many different instruments have been employed, some of which are still in use and are favorites with the artillerists of different countries. In the United States service, the "Navy," "Bruton," "Vignotte," "Schultz," and "Boulonger" instruments have been and, with the exception of the "Navy," are still used.

All these instruments measure very short intervals of time; some, by means of a falling weight under the influence of gravitation; others, by the oscillation of one or more pendulums of known length; and others, by the isochronism of musical vibrations; and, besides measuring an interval of time, enable us to divide it into fractional parts and record its beginning and end, by means of electricity, either through the influence of electro-magnets, or by the spark from an induction coil.

As a representation of the first class, the Bruton instrument will serve for description. It consists of a graduated semicircle, supported on a tripod vertically, in front of which two pendulums, of equal length, are suspended on journals whose axes are on the same plane. The pendulums oscillate freely, close to the arc. The inner has an arm or marker on its end, which is struck by the outer one as they pass one another. An electro-magnet at each end of the diameter of the semicircle serves to hold the pendulums in a horizontal position, ready for recording. Each magnet is connected with a frame, the first near the muzzle of the piece and the second 100 feet farther on in the path of the projectile. Across each frame, the wire from its respective magnet and battery is passed to and fro, at such distance as will insure its being broken by the projectile in passing through. The battery circuits can be closed and broken at will, by means of a disjunctor.

To test the adjustment of the instrument, the circuits are closed, and the pendulums brought into contact with their respective magnets, where they remain in a horizontal position. The disjunctor is made to break both circuits simultaneously, the magnets become passive, and the pendulums begin their oscillation; they meet or pass one another at the lowest point of the arc, which for convenience is called the zero of the graduation; and at this point a mark is found, near the scale, indicating the place at which they passed. A spring receives each pendulum as it completes a single oscillation and holds it until released for another experiment. The trial thus described having shown that all is in order, the circuits are again closed, the pendulums suspended from their magnets, and the word "fire" is given. The projectile passes through and breaks the first target, and the corresponding magnet releases its pendulum, which begins an oscillation; meanwhile the projectile has advanced to the second target, breaks it, and the corresponding magnet and pendulum are similarly affected. In this case the pendulums, not beginning their oscillations together, do not meet at the zero point of the arc, but some distance to one side of it, where the mark indicates the number of degrees from zero at which they passed. The time of oscillation of the pendulums being known, the short arc enables us to find the time between the fall of the first and second pendulum, which equals the time occupied by the projectiles in passing from the first to the second frame or target; and the space between the targets divided by the interval of time gives the initial velocity. For example, suppose the value of the interval to be one tenth of a second, and the space passed over to be 100 feet, then: $100 \div 0{\cdot}1 = 1{,}000$ feet per second.

The Benton instrument was invented by Major J. G. Benton, of the United States Ordnance Corps. It is probably the best of the pendulum instruments; and, for measuring velocities by means of a single interval of time, is unequaled for general accuracy and ease of manipulation: but a pendulum instrument is limited to this use, and involves sources of error which later ones of different construction are intended to overcome, by discarding the pendulum and adopting a more sensitive agent to indicate the very small intervals of time required.

Prëeminent among these stands the instrument invented by Captain Schultz of the French artillery, and known as the "Schultz chronoscope." It consists of a bed plate on which is mounted a cylinder with clockwork and a screw to give it simultaneously a rotary and lateral motion on its axis; a vibrating fork, whose function it is to trace a scale of time on the surface of the cylinder (which has been previously smoked by the flame of an oil lamp), by means of a quill point attached to one of its arms and resting lightly on the surface of the cylinder, in front of which the fork stands, clamped to the bed plate. The fork is made to vibrate, without fluctuation, by an electro magnet mounted near the end of each of its arms, which alternately attracts and releases them without contact. The electro-magnets are controlled by an "interrupter," which closes and opens their battery circuits as often as the fork vibrates, which is about 500 times per second.

The rotary and lateral motion of the cylinder cause the fork, when at rest, to trace a fine line on its surface from end to end in the form of a helix or spiral, and, when the fork is in vibration, the sinuous line it traces intersects this fine line at the beginning and end of each vibration. The "rate" of the fork is found by connecting a break circuit seconds pendulum with the primary wire of the Rhumkorff coil, whose secondary wire delivers an induction spark on the surface of the cylinder, beside the trace, every second; the number of vibrations between each spark shows the rate of the fork per second, which rate is constant for the same fork.

In like manner the rupture of the target wire (which is in circuit with the primary wire of the coil) by the bullet gives a spark for each, and the number of vibrations traced between the two sparks indicates the time the projectile took to pass from the first to the second target. A micrometer microscope is provided to read fractions of a vibration, and by its use the value of the interval can be determined to within $\frac{1}{50000}$ part of a second.

This instrument is not so easy to manipulate as the one previously described, but it yields more accurate results and is susceptible of more extended use. It will record intervals continuously for 25 or 30 seconds, and so permit of investigating the motion of a projectile through its entire time of flight, and yield data for determining the resistance of the air on its cross section. It has been used to measure the time of passage of a musket bullet over the space of one foot, the average of ten trials being 0·000914." It may also be used to investigate the motion of the projectile within the bore of a gun, an experiment which has been recently made by Captain Noble, of the English service, with a chronoscope of his invention, in which rapidly revolving disks, of almost uniform motion for short periods of time, serve to receive the electric record from the targets.

The *data* furnished by such experiments are of the highest importance in the selection of suitable powder for guns of various calibers and the best forms of projectiles, and the instruments just described are fully equal to the solution of all the problems of modern gunnery lying within their field of research, and may well be expected to hold their prëeminence for many years to come.

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## THE PRACTICAL ASPECT OF THE EIGHT HOUR LAW.

Supervising Architect A. B. Mullett of the Treasury Department, in his recent annual report, cites various forcible objections to the eight hour system, gleaned from his experience in the employment of labor in the construction of government buildings, since the passage of the act of Congress fixing the above number of hours as a legal day's work. He draws the general conclusion that the practical operation of the law has led to undesirable results.

In brief and generally, it appears that the eight hour system means not merely two hours less toil per day for the workman, but two hours daily practice in habits of idleness with their attendant train of evils; while to the employer and the community at large it indicates a deprivation of useful and valuable labor in a proportion constantly increasing, above its initial limit of twenty per cent, with the length of time the plan is in existence.

Mr. Mullett, in his communication to the department, states the more especial objections to the law, as follows:

"I desire once more to call attention to the eight hour law, believing it to be alike injurious to the best interests of the government and to the workmen themselves. It frequently happens that mechanics and laborers employed by

the government and those employed by contractors are required to work on the same building, and at the same time. Those employed by the government work but eight hours, while those employed by the contractors work ten hours *per diem*. This causes much feeling, and it needs no argument to prove that it is unjust, and that the mechanic who performs ten hours' work is taxed for the benefit of the more favored workman who has friends and influence sufficient to obtain employment for him on government work. It is also in direct violation of the principle of civil service reform, inasmuch as it converts the employment of mechanics and laborers from a business question of competency and industry to a question of political patronage and personal influence. I do not hesitate to say that it has cost the government millions of dollars, without benefiting the mechanic or laborer in the slightest degree, or, as far as I am advised, any other persons than perambulating or paid agitators, or the claim agents who have instigated litigations and claims for their own benefit. The law has been fairly and fully tested; the experience of this department, as well as of private establishments, has shown that it is not only impossible for a man to perform as much labor in eight hours as in ten, but that he absolutely performs less work per hour under the eight hour system. It is a matter of neither interest nor importance to me whether mechanics and laborers perform eight or ten hours' work, provided the hours of labor are the same on public as on private works. It is, however, impossible to conduct work in a proper manner under a system that increases the compensation of mechanics and laborers employed by the government 20 per cent above market rates, and thus makes them a favored class, without, as I have previously shown, obtaining any advantage therefrom. I would therefore recommend that such modification of the law be obtained as will entitle all persons employed by the government to the highest market rates for their labor, and the benefit of all local rules and regulations in regard to the hours of labor, or otherwise. If this rule is, however, to be the permanent policy of the government, and its mechanics and laborers are to be compensated at the rate of 20 per cent above the highest market rates, I see no reason why officers, clerks, and other employees of the government should not be paid by the same rule. Under the present system, gentlemen of education, who occupy positions of trust and great pecuniary responsibility in the different bureaus, actually receive less than mechanics' wages, and are discriminated against in favor of men who, as a rule, exhibit little interest in the performance of their duties, and have no responsibility whatever. It is also a fact that many mechanics receive, under the present system, not only more than their foremen and master mechanics, but more than the superintendent of the work on which they are engaged, the latter classes being allowed no compensation for extra labor performed."

## JONAH AND THE BELGIAN ACADEMY.

*Les Mondes* devotes four pages to a piously indignant and argumentative editorial on a recent dissension in the Royal Academy of Belgium, regarding the rather antique subject of Jonah and the whale. A member of that institution took occasion, in the course of a paper upon South American travel, to allude to the habits of the dolphin; and in the copy of his remarks submitted for publication, he added a foot note, to the effect that an ancient European legend attributes to these fishes the habit of bringing to land the bodies of drowned persons, which their instinct teaches them to recognize. From this circumstance, says the author, doubtless arose the fable of Jonah. The unlucky word "fable" seems to have set the learned members of the Academy by the ears. Two have resigned, and now an internecine war, aided and abetted by *Les Mondes* and other scientific journals, is raging fiercely.

As we are sufficiently removed from this important controversy to enable us to regard it with dispassionate and philosophical calmness, we may venture, with all humility, to observe that it is utterly immaterial to the progress of modern science whether that whale did or did not swallow the prophet, and that we are unable to perceive why the single member's belief regarding Biblical traditions should so stir up the gall of the *savans* of France and Belgium, to the extent indicated by the elaborate and bitter argument in support of the story published in our contemporary. Has Science grown so poor as not to furnish material enough for profitable discussion, that *Les Mondes* and the Belgian Academy must thus employ their talents in wrangling over a dubious legend of the far past?

## HINTS FOR CHEAP FLORAL DECORATION.

The introduction of natural ornaments into our houses is of comparatively recent date. Fashion in her changing moods has willed it, and the conventional and artificial have had their day. Rustic baskets of trailing ivy, stands of gaily tinted growing flowers, mimic ponds teeming with finny life, and vases of autumnal leaves and grasses have replaced the cumbersome china or queer old ornaments of buhl and marqueterie; and even in art, the graceful negligence of nature is imitated in the decoration of our modern dwellings, in showy contrast to the geometrical embellishments and prim finery of the houses of half a century ago. And this is true alike in public as well as in private edifices. One of the recently built theaters, in this city, in place of the meaningless frescoes surrounding its proscenium arch, substitutes huge palm trees with their broad leaves (of tin) drooping from their summits; another fills its lobby with vases of flowers and trailing plants, while a third arranges similar ornaments in conspicuous places in its auditorium, and rumor says a fountain is to be constructed in the center of the parquet.

Like all fashionable articles, however, and especially in cities, the question of the expense of such decorations is by no means an unimportant one, and doubtless many of our country readers would stand aghast at the prices demanded by New York florists for baskets of the commonest wild grasses and ferns, even such as flourish in abundance on every brook side. Fifteen dollars is the usual cost of a simple rustic stand, filled, and hanging baskets range from five to ten dollars each. The more elaborate devices, which include bowls of gold fish, or cages of birds, with, perhaps, a few exotic plants, bring sums which are far beyond the reach of ordinary purses. Paying these prices is, however, not at all necessary, if one has a little mechanical ingenuity coupled with a fair share of good taste. We have made beautiful flower baskets from old wooden chopping trays that have survived their turn of usefulness in the kitchen, though perhaps clean new ones would be better. All the materials needed are some sticks of red cedar with the bark on, or, if this variety of wood cannot be obtained, almost any kind can be pressed into service, except ailanthus and kindred sorts, the bark of which peels off bodily; a few bits of rattan, some gnarled roots, a paper of brads, and a little varnish, complete the requirements. A good plan is to cut the cedar sticks into pieces, say three inches long, split them, sharpen both ends, and nail these neatly around and outside the upper edge of the bowl. Then fasten bits of root or twine the rattan around beneath and finish with an irregular knob below. For handles, select three strong pieces of rattan, and secure them firmly to the bowl, letting them extend about two feet above the same and meet in a neat loop. The bowl should not be less than six inches deep, in order to give the roots of the plants plenty of room to grow downward. After the construction of the basket is finished, give it a coat of varnish and the work is done. Dried walnut skins, pine cones, acorns, split butternuts, or even chestnut burrs may be used as ornaments instead of pieces of root. We have also seen some very neat arrangements made entirely of the shells of English walnuts, which had been carefully removed. In filling the basket, first place some broken stone or bits of china at the bottom to serve for drainage, and above add loose earth made of two thirds garden soil and one third sand. As regards plants, unless the basket be large, or a stand (which, by the way, can be made of a soap box, lined with zinc and mounted on feet) be used, we do not believe in any large variety of flowers in a single receptacle. It is nonsense to mix exotics with wild ferns and grasses, because the nature of soil which suits one is generally not beneficial to the other; and very often the warm uniform temperature, necessary for delicate plants, is fatal to the more hardy varieties from the woods and pastures. Fill a basket entirely with English ivy or smilax, and a luxuriant growth can be obtained, particularly if too many shoots be not set in. City florists aim to cram as much as possible into their baskets, and are totally regardless whether the broad leaves of the begonias shade the stems and roots of the more delicate creeping vines. In first setting in the plants, however, place them for a few days in a cold room until new shoots appear. Remember also that plants, and especially ivy, will not grow without light, particularly in the house. Place a pot of ivy, after it has begun growing, for a few days in the shady part of a room, and the young shoots will speedily turn white, while the older leaves will begin to drop off. There is another fact that amateur house gardeners forget, and that is that the roots of a plant need plenty of air; and hence pretty pots of painted china or majolica ware will not answer to contain the earth for their reception. If such vessels be used, the common earthenware pot must be set inside of them, with plenty of intermediate space between; while care should be taken that the higher edges of the outer pot do not shade the base of the plant. Weak vegetation may be rejuvenated with a little ammonia, but it must be used with care, as too much kills. About two drops in a teacupful of water given once a week, we have found to be plenty for a good sized plant, particularly if the earth around the roots be kept loose and not allowed to pack hard.

A very pretty adornment for picture frames is German ivy, a common trailing vine which grows with great luxuriance. All the old medicine phials which infest out of the way closets may be utilized for this purpose. These should be filled with water and hung behind the pictures, and a slip of the ivy inserted. The vine is quite hardy. We have seen a single slip, in a pint bottle, grow until it ran along the entire length of a moderate sized room. In the back volumes of our journal will be found described a host of ingenious ideas of this description. We recently noted a way to raise oak trees in hyacinth glasses, it being merely necessary to suspend the acorn inside and a little above the water. A sponge moistened and with fine seed scattered in its pores, soon becomes a mass of living verdure, though a prettier ornament we think can be made of a large pine burr, similarly prepared and hung, like the acorn, over water. Fine grass seed is the best to use. Wardian cases are very easily made. A shallow box lined with zinc, with some holes on the sides to ventilate the soil, and a large glass shade, easily obtained for a small sum, answer the purpose. The plants take care of themselves, the water which they evaporate condensing on the glass and running back to the soil, so that a species of circulation is constantly maintained. Insect fanciers can combine animal and vegetable life very nicely in one of these cases, as quite an assortment of bugs may be kept alive in them even through the winter. Of course such varieties should be selected as will not feed on the plants.

About as pretty a vine as can be selected for window dressing may be obtained from the ordinary sweet potato. The bulb need only be set in a hyacinth glass, and it will soon send out shoots. Hyacinths look very pretty on a window sill; but in raising them in glass, it should be remembered to keep them in the dark until the roots are two inches long, and also to change the water frequently, never allowing the new supply to be colder than that removed. Dried leaves and vines also make tasteful ornaments if they are properly prepared. Doubtless many have gathered fall leaves, and are waiting for a convenient rainy Saturday to arrange them. To such we may remark that the best plan is, not to use varnish, because the leaves thus treated soon lose their color. Wax is preferable, and is easily laid on with a warm sadiron. Group the leaves in bouquets with plenty of fern, fasten them at the back to a piece of cardboard, and tack them against the wall. We recently gave a description of how very pretty leaf pictures may be made, to which the reader should also refer. German ivy, dried in sprays, looks nicely over pictures in places where the plant will not grow in the bottle or where the living vine is not desired.

## AN EASY TELEGRAPH CODE.

The following is suggested as an easily learned code for general use, by which messages of all kinds may be transmitted with certainty, by means of the ordinary electric telegraphic instruments, by means of bells, by whistles, by firearms or cannon, by lights, lanterns, rockets, or flames, by the flash of reflectors, by flags and levers, by the motion of the human limbs, arms, hands, or fingers. It may be written on paper, communicated by touch, drummed on the table, or transmitted by any of the known means of signalizing. It may be employed with facility by the blind, the deaf and dumb; and will enable people who must talk in church to do so without disturbing their neighbors. It may be learned by anybody in five minutes.

The code is formed by dividing the alphabet into five sections, represented by the five vowels, A, E, I, O, U. Everybody can remember the vowels. For the first vowel, A, make one stroke, flash, sound, or motion: for E two strokes, I three strokes, O four strokes, U five strokes. Make the motions for these section letters quickly, but evenly.

For the remaining letters, give the signal for the section letter, as above, and follow with one stroke for each letter belonging to that section until the letter wanted is reached.

THE SCIENTIFIC AMERICAN TELEGRAPHIC CODE.

| The Section letters are | A | E | I | O | U |
|---|---|---|---|---|---|
| | B | F | J | P | V |
| | C | G | K | Q | W |
| | D | H | L | R | X |
| | | | M | S | Y |
| | | | N | T | Z |

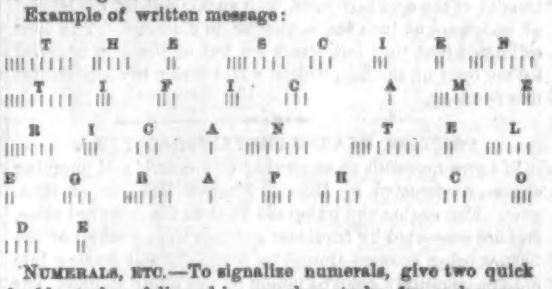
Example: To signalize the letter D, give one stroke for the section letter, A, and follow with three slow strokes, the last being the signal for D.

To signalize L: Give three quick strokes for the section letter I, followed by three slow strokes, the last being the signal for L.

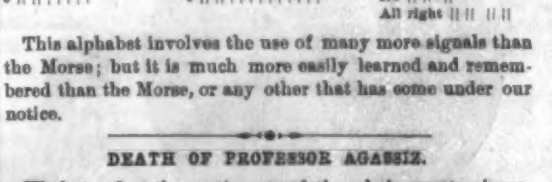
To signalize W: Give five quick strokes for the section letter U, followed by two slow strokes, the last being the signal for W.

The quick strokes are to be made twice as fast as the slow strokes. Practice slowly. Speed will follow accurate practice. After each complete letter signal is given, a space or pause, equal in duration to one quick and one slow stroke, should be made. The space or pause between words is equal to two long strokes.

Example of written message:




NUMERALS, ETC.—To signalize numerals, give two quick double strokes, followed by one slow stroke for each numeral until the figure wanted is reached. Thus:




This alphabet involves the use of many more signals than the Morse; but it is much more easily learned and remembered than the Morse, or any other that has come under our notice.

## DEATH OF PROFESSOR AGASSIZ.

We but reflect the sentiments of the whole country in expressing our deep regret at the news of the death of Professor Louis Agassiz. For nearly a week past the medical bulletins extended no hope of improvement, and it is stated that paralysis had affected the organs of the throat and incidentally almost the entire body. There were fears that, even if life had been spared, the physical system would be so shattered as to render it a total wreck, leaving the patient utterly helpless and condemned to a languishing existence, worse even than death. He died in his sixty-seventh year.

In the deepest sorrow that this terrible affliction has not been averted, we know that every reader of our journal will most cordially join with us. The loss of the man who, above all others, has been universally considered the representative and exponent of American scientific progress, and to the grandeur and vastness of whose mastery over thought and knowledge the world did homage, will indeed be irreparable.

### THE WEEPING SOPHORA OF JAPAN.

As yet we do not know the full value of weeping trees. It is a peculiarity of most weeping trees not to show their full beauty of character till they have attained a considerable age. Who knows anything of a weeping beech who has seen only a young specimen recently planted? Why, it is passed by as a mere curiosity. But give it a generation, and it becomes as picturesque as a gale-tossed ship. So it is with the weeping mountain elm. Some species, it is true, show their beauty from an early age; but the above named marked examples point to the probability that we cannot judge of the effect that will finally be produced by kinds obtained in recent years.

One of the most beautiful of all weeping trees is the weeping form of that fine tree, the Japanese sophora (*sophora japonica pendula*), of which we present an engraving. When well developed, it is attractive in winter or summer. It is more picturesque in outline than the weeping willow, while the shoots hang most gracefully. It is rather a slow grower, its only fault; like the normal form, it would thrive well on dry soils.

As to the position suited for this tree, says *The Garden*, there is no fairer object for isolation in some quiet green bay of the pleasure ground or lawn. It should never be crowded up in a plantation or a shrubbery with a number of ordinary trees, which, if they do not rob it at the root, or shade it at the top, will prevent its beauty from being seen.

THE WEEPING SOPHORA OF JAPAN.

### Huge Cuttle Fish.

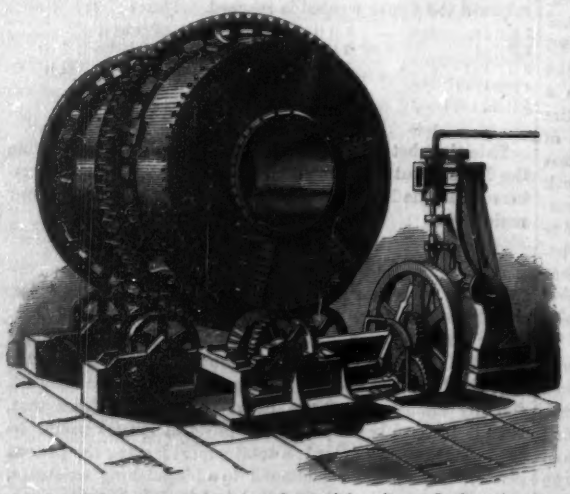
Mr. Harvey, of St. John's, Newfoundland, reports that, on the 26th of October last, two fishermen, who were out in a small boat, observed some object floating on the water at a short distance, which they supposed to be a large sail or the *débris* of a wreck. On reaching it, one of the men struck it with his gaff, when immediately it showed signs of life and reared a parrot-like beak, which they said was as big as a six gallon keg, with which it struck the bottom of the boat violently. It then shot out from about its head two huge, livid arms, and began to twine them around the boat. One of the men seized a small ax and cut off both arms as they lay over the gunwale, whereupon the fish backed off to a considerable distance and ejected an immense quantity of inky fluid, that darkened the water for a great distance around.

The men saw it for a short time afterward, and observed its tail in the air, which they thought to be ten feet across. They estimate the body to have been sixty feet in length and five feet in diameter, of the same shape and color as the common squid, and moving in the same way as the squid, both backward and forward. One of the arms which the men brought ashore was unfortunately destroyed, but a clergyman who saw it assured Mr. Harvey that it was ten inches in diameter and six feet in length. The other arm had six feet of its length cut off before leaving St. John's; the remainder, which measured nineteen feet in length, is but three inches in circumference, except at the extremity, where it broadens like an oar to six inches in circumference.

As usual in the cuttle fish, the under surface of the extremity of the arm is covered with sucking disks, the largest of which are an inch and a quarter in diameter. The men estimated that they left about ten feet of the arm attached to the body of the fish, which would make it about thirty-five feet long.

### FRICTION GEARED CENTRIFUGAL PUMP.

We give herewith an engraving of a centrifugal pumping engine, constructed by Messrs. Marquis Brothers, of Glasgow. The engine and pump are fixed on the same bed plate, and are connected by frictional gearing, the fly wheel of the former being grooved around its periphery and gearing into a correspondingly grooved pinion on the pump spindle. The



arrangement is very compact, and provision is made for obtaining ready access to the pump disk by removing a side door with which the casing is fitted. The piston rod, connecting rod, and pump spindle are of steel, and large bearing surfaces are provided. The particular pump shown is intended for use on shipboard for pumping out water, ballast, etc., or for circulating the water in surface condensers In some cases, Messrs. Marquis Brothers substitute ordinary for frictional gearing, while in others, as, for instance, when the lift is low, they connect the engine direct to the pump spindle.—*Science Record* for 1873.

### A New Gas Apparatus.

MM. Muller and Eichelbrenner, of Paris, are the inventors of apparatus for producing illuminating gas from coal, etc., which will probably find much favor among gas engineers. Already fifteen gas works in France have adopted it, and it has generally met with much approval. The inventors require no change in the ordinary arrangement of the works, but they do away with the old furnace and replace it by one of considerably smaller dimensions, placed at the back of the bridge, and surmounted by a receptacle of a slightly conical form. This can be filled with coke by its lower door, which is ordinarily kept closed, and its capacity is such that it does not require charging more than once in eight or ten hours. This plan is exceedingly advantageous for small gas works, preventing as it does the necessity of firing during the night.

This furnace is literally a gas producer, the fuel being kept in such a state of combustion, by regulating the admission of the air, that, practically, distillation of the volatile products is carried on. When leaving the furnace, the carbonic oxide and other combustible gases that have been generated enter into a cylinder at the back of the bridge, whence they pass into the oven by a series of openings, distributed over the entire length of the bottom. By means of other openings air can be admitted, which has already been heated during its passage from the external atmosphere, into the apparatus. The amount of air, and consequently of the combustion of the gases that must ensue, is regulated by a register placed on the exterior of the oven. By means of refractory earthenware plates, that can be forced against each of the openings to stop the passage of the gas, the rate of combustion can be more completely regulated, and the temperature of all parts of the oven equalized. This heating of the air, effected by a method already familiar in the heat-economizing furnaces of Siemens, Ponsard, and others, is less complete than theirs, but less expensive in its first construction. According to a report by M. Launy, the ease of working the furnace is great, the expenses generally are much reduced, and the removal of cinders and ash is not required. The principles applied are not new, but MM. Muller and Eichelbrenner have the merit of having combined a variety of conditions of simplicity, efficiency, and economy that had not previously been realized. M. Launy visited the gas works of Montreuil, where one of these new furnaces had been erected alongside one of the old system, and expressed himself surprised at the results just mentioned, and generally gratified with its success.—*Engineering*.

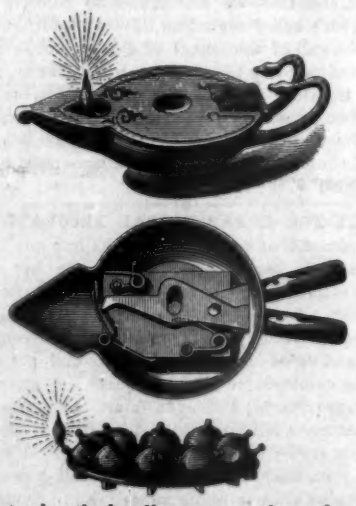
We call our readers' attention to Messrs. Harper Bros. advertisement on the last page of this issue, and to their terms of subscription for their three widely renowned periodicals, which maintain their excellence and their reputation as examples of the highest class of American literature.

### What Measure of Expansion will require Least Steam per Horse Power?

We reply to this question that the best measure of expansion lies somewhere between six times and ten times, but it is generally nearer the first limit than the last, and that in fact the gain to be had from working up to a tenfold expansion is so small, as compared to the gain to be had with a sixfold expansion, that it is not worth the trouble. If we were called upon to design an engine of maximum economy—we mean an engine of considerable power and one expected to perform its duties under ordinary conditions—we should not think of adopting a grade of expansion higher than eight times—though we should provide for the earlier cut-off in order to give the governor the control of the engine—and under no circumstances should we permit the terminal pressure to fall lower than 10 pounds above a vacuum. For a tenfold expansion, this contemplates an initial pressure of 100 pounds, and for an eightfold expansion a pressure of 80 pounds absolute, or safety valve loads of 85 pounds and 65 pounds; and it is more than probable that in both cases better results could be had with a sixfold expansion only, giving a terminal pressure, in the first case of 16·6 pounds, and in the second of 13·3 pounds. Having thus stated our opinions, it now becomes our duty to explain why we have formed them. Unfortunately, the whole question is more or less one of opinion from beginning to end. We base those we have expressed on the fact that the entire experience of sea-going engineers and marine engine builders is to the effect that little or nothing is to be gained by expanding steam more than five times. For example, the Elbe, with an expansion of about twelvefold, burns, we believe, about 2·25 pounds of coal per horse per hour; but we have engine room logs in our possession which show a consumption of but 2 pounds, and even less, with a sixfold expansion, or one half that used in the Elbe. Indeed, there is scarcely a well authenticated instance on record where better results have been got with very high measures of expansion than with much larger admissions. On the contrary, very careful and elaborate experiments, carried out in the United States and elsewhere, all demonstrate that measures of expansion much exceeding sixfold give no advantage whatever; and when once this point has been reached, there is a tendency to an increased consumption of steam, which becomes well marked as earlier cuts-off are reached, unless the pressure of steam is very high to begin with, as, for example, in Perkins' engines. If any of our readers can cite cases where large measures of expansion did in themselves secure exceptional economy, a statement of the facts will constitute a very interesting contribution to our correspondence columns. It may be urged that in the engine using a high measure of expansion, the economy effected in the use of steam will quite counterbalance this loss, and leave a large margin of profit. Nothing is easier than to prove this—on paper. In practice, however, we believe, nay, we know, that the consumption of steam would be absolutely larger in the more expansive engine than in its rival. This, it is impossible to prove on paper; but our readers may rest assured that it is consonant with experience, and we have no doubt that the proposition will be endorsed by many competent engineers.—*The Engineer*.

### THE AUTOMATIC TAPER LAMP.

There has recently been invented, says the *Science Record* for 1873, a taper lamp for the instantaneous production of a flame or light, which is accomplished by simply pressing together thetwo handles shown in the upper figure of the annexed engraving. The interior mechanism is shown in the figures below. Each tube consists of a little ball of fatty material from which protrudes a short match. These tapers are all set on a rotating plate, under the lamp cover, and are so ar-

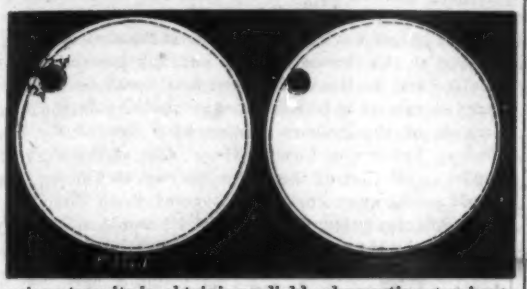


ranged that, when the handles are pressed together, the plate rotates, and one of the matches rubs against the inside of the case near the spout or opening in the cover, which rubbing or friction ignites the match and communicates fire to the ball, which thereupon burns, producing a light that lasts from five to seven minutes. This is a very curious as well as a useful little example of mechanism.

## AN AUTOMATON TRANSIT OF VENUS.

The Astronomer Royal has recently designed and constructed a working model to show the phenomena of the transit of Venus, of a peculiarly complete and simple character, which we show in Fig. 3. A few words only are necessary to enable any of our readers to appreciate its object and scope. A transit of Venus occurs only twice in about 120 years; and hence the importance of observing this phenomenon. The feature to note is the exact instant at which the edges or limbs of Venus and the sun are in contact during the passage of the former across the disk of the latter.

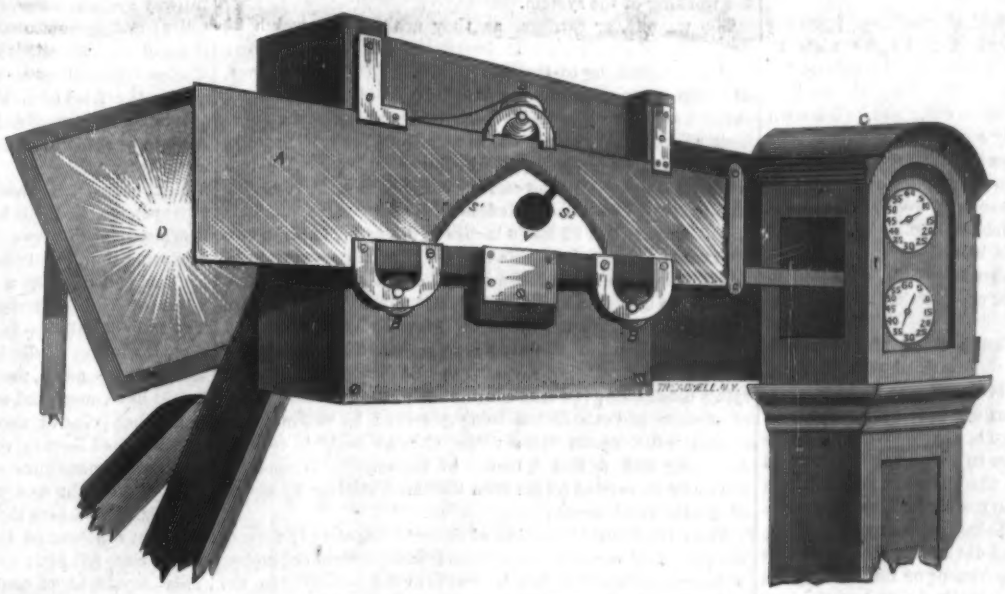
Very great difficulties have been found on the occasion of



previous transits in obtaining reliable observations, owing to the peculiar optical effects accompanying the phenomenon and the consequent difficulty in insuring the observation of the same particular phase in the transit by all observers, as well as the doubt arising from the exact effect of the peculiarities of each telescope and each observer. So great indeed have been these difficulties that the observations of the transits that have hitherto taken place—observations made at great trouble and expense—have been found of very doubtful value. It is, therefore, most important that uniformity in habit of observation should be acquired by all the officers and others leaving England to observe the transit of Venus in 1874. To this end systematic practice of some kind is desirable. How is this to be obtained with a phenomenon occurring only twice in 120 years? Careful observations of the transits of Jupiter's satellites have been recommended, but Sir G. Airy has met the difficulty by a device which appears to give a singularly close copy of the transit of Venus, and on which observers may try their powers to their heart's content. Before giving a description, however, it is well to understand the difficulty to be dealt with in the observation of a transit of Venus. Fig. 1 represents the sun with Venus coming on to it about the moment of internal contact. There is a ligament connecting the black disk of Venus with the sky at the point of contact. This ligament is the main cause of the trouble. It is nearly, if not always, seen, and is explained in the following way:

Any brilliant object dazzles the eye, and by irradiation appears to be larger than it really is; thus, in Figs. 1 and 2, we suppose the real size of the sun to be indicated by the dotted line, while the apparent disk is the size of the larger circle. So again Venus should be seen the size of the small dotted circle, but the sun so far encroaches on her that she only appears to be the size of the black disk whenever her edge is seen against the sun. But up to the moment that the entire edge of Venus enters within that of the sun, the light cannot encroach at the part that, as yet, is not projected against the sun but only against the sky. Consequently, the limb of Venus that last enters on the sun's disk is for a time seen its full size; and the light, as the limb of the sun concealed by it, can neither encroach on the sky nor on Venus. In short, at this point the edges of Venus and the sun are those shown by the dotted circles, and thus the black sky and black disk of Venus meet where the circles, *s s* and *v v*, meet, and thus the ligament is formed. It has been supposed that directly Venus enters within the sun's disk, as shown in Fig. 2, the light rushes in and encroachment takes place. Supposing this to occur immediately after internal contact, it is clear that, when understood, the peculiarity of the phenomenon would greatly facilitate its being accurately observed and recorded. It is clearly necessary, however, to ascertain the truth of this supposition.

Fig. 3 shows the apparatus designed by Sir G. Airy to represent the transit of Venus, at which the officers and other observers now practise. A glass slide, A A, with a black disk (to represent Venus) fixed on it, is drawn by clockwork across the opening, $S_1 S_2$, cut in a screen. The curves, $S_1$ and $S_2$, correspond to the limbs of the sun at the moments of ingress and egress. By means of the looking glass, D, the reflected beams of the sun are thrown through the opening, $S_1 S_2$, and the result is that the phenomena of encroachment of light and ligament, or "black drop," is seen in an actual transit. The rate of motion and size of Venus are calculated so as to give the same apparent dimensions and movement when seen on the main building by observers on the top of the magnetic buildings in the Royal Observatory, Greenwich, as those of Venus at the expected transit. The limbs of the sun are brought together and make an arch, in order to give ingress and egress without unnecessary loss of time. We have said that our observers are practising daily at this model, and it may be expected that their personal equations and the effects of peculiarities in telescopes will be clearly established. We may add that some rather unexpected facts have come out, which seem to indicate that a modification of the generally received explanation of the behavior of the black drop, which we have given above, may be necessary. For example, it is found that with a smaller telescope Venus is seen to leave the limb and enter within the sun's disk later, and come in contact again at egress earlier, than with a larger glass. Then, again, it is found that, with a brilliant blaze of sunlight, a ligament is seen in a position when with a faint light it would have disappeared. This is rather contrary to the generally received ideas. It is premature, however, to say much now. A few weeks' work may establish very valuable results.—*The Engineer.*



AUTOMATON TRANSIT OF VENUS.—Fig. 3.

## RECENT GEOGRAPHICAL NOTES.

During the past year, MM. Stuebel and Reiss have explored the Andes of Ecuador, and ascended Mounts Chimborazo, Aetar, Cotopaxi, and Tunguragua. Among the volcanoes of the chain, three exhibit especial characteristics and only one, Pichinchae, retains a moderate activity. We note no especial results of the labors of these explorers, beyond the determination of the altitudes and physical characteristics of the mountain range, and certain trigonometric calculations or observations having for their object the completion of accurate maps of the country.

H. B. M. ship Basilisk has taken possession in the name of the Queen of England of the western coast of New Guinea. This great island is peopled by a long haired black race known as Papous, and is said to be very fertile. The Basilisk explored the coast for a distance of 140 miles and discovered the bay of Youl, to which the name Port Moresby was given. A channel was also found, which, it is believed, will materially improve the route now followed by steamers between the Asiatic and Western American coasts.

There exist in Copenhagen and Moscow remarkable ethnological museums. That in the former city is comprised of forty rooms, in which are exhibited, all the objects and documents relative to the arctic regions. The Moscow museum has sixty wax figures showing the different races existing in the Russian Empire, of which thirty represent types found in European Russia and the Caucasus. The comparison of the contents of the two museums has recently led to a discussion regarding the Ainos, a race now inhabiting the Saghalien Yesso and the Kurile Islands. M. de Quatrefages states that the people once formed a great nation, which extended itself over the Indian Archipelago, conquering the country and founding the present Japanese Empire. The Japanese, however, soon became a distinct race, through intermarriages with the Chinese, and the Ainos gradually disappeared, until only a remnant of the pure stock now exists. They clearly belong to the Caucasian division of mankind, and are also believed to be the progenitors of the Esquimaux of North America.

Dr. Nachtigal, a German traveller, at present engaged in exploring central Africa, has been recently heard from. He has traversed the shores of Lakes Tchad and Chosi, and arrived at a capital city called Abon-Cheu. The inhabitants are violent, quarrelsome, and intemperate, hating strangers, and only ruled by the tyrannical power of their sultan. The commerce consists in slaves, ivory, and ostrich feathers, and flows mainly to Egypt.

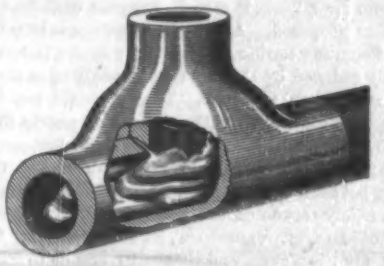
M. Delesse announces the discovery of new silver mines at Caracol, near the frontiers of Chili and Bolivia. Sulphides and sulphates of silver are found associated with argentiferous lead. The mines were found by Frenchmen, and a capital of thirteen million dollars is to be raised for their exploration.

J. W. writes that 400 men were killed in the State of New York, in seven months, while coupling cars.

## CARELESS PLUMBING.

We should advise such of our readers as are plumbers to cut out the accompanying little engraving and post it in a conspicuous place in their shops, so that all their journeymen may have it constantly before their eyes. It indicates about as disgraceful a botch as any mechanic who pretends to the smallest degree of intelligence could hope to accomplish.

The piece of piping represented was recently removed from a building, situated in this city and owned by a gentleman with whom we are well acquainted. For some time past, continual complaints have been made by tenants of a



failure in the proper water supply. An experienced mechanic was set to work to discover the trouble. After exhausting his ingenuity in trying to remedy the defect, he finally concluded that the main pipe was too small, so a larger connection was laid at great expense; still the difficulty continued. It was finally determined to cut away the joints of the conduits through the building. This was partially done, when the piece shown in our engraving was removed, and the cause of the trouble at once made apparent. The individual who mismade the joint (we cannot do violence to our feelings by calling him a plumber) carelessly fitted the connection to the larger pipe, and by so doing allowed his solder to fall into the bore of the latter, choking it up almost completely. The fragment is now before us; and estimating the pipe to be about ¾ inch originally in internal diameter, it is evident that the solder has reduced it to an opening of probably barely a tenth of an inch.

It occurred to us that doubtless many of our readers are experiencing difficulty with the water arrangements of their buildings, and vainly seeking just such a hidden cause as this; hence we have had the annexed engraving made in the hope that it may serve as a suggestion of value. In any event, it will do for a warning to plumbers to be careful in soldering pipe joints.

### A Tower Taller than Babel.

Messrs. Clarke, Reeves & Co., proprietors of the Phœnixville Bridge Works, Philadelphia, Pa., propose to construct a wrought iron tower, one thousand feet in hight, to be completed for the American Centennial Exhibition in 1876. The tower is to be circular in section, one hundred and fifty feet in diameter at the base, diminishing to thirty feet at the top. It is proposed to have spiral staircases winding around the center tube for those preferring to walk up; but elevators will be provided, which are calculated to ascend to the top in three minutes. We have in process of engraving a full page illustration, representing the tower in contrast with St. Peter's Cathedral, Rome, St. Paul's Cathedral, London, Bunker Hill Monument, the Pyramids of Egypt, and other existing tall structures, all of which, alongside of the thousand feet tower, look like pigmies.

This is one of the greatest engineering projects of the age, and it is in the hands of constructors capable of completing whatever they undertake. The beautiful engraving we are having executed will be ready for publication in the SCIENTIFIC AMERICAN within about two weeks. We calculate that it shall be the handsomest wood engraving that has appeared in any American newspaper. The copy of paper containing this engraving will be worth a whole year's subscription.

### Frigorific Effects of Capillarity and Evaporation.

By directing upon a sheet of spongy paper, wet with bisulphide of carbon, a spray of pure water, hoar frost is not formed; but if the conditions be reversed, and the bisulphide applied in a finely divided spray, (according to M. Décharme) a circle of arborescence becomes quickly apparent. The same jet, directed on the bulb of a thermometer, produces first hoar frost and then arborescence, together with a lowering of temperature from +50° to —7° Fah. Arborescence thus formed upon a glass plate may be retained long enough for examination by the microscope. Other liquids which are capable of producing similar effects to bisulphide upon spongy paper are chloroform and rectified sulphuric and bromhydric ethers. The icy arborescence is believed to be purely aqueous. Its point of fusion corresponds exactly with 0° C. (32° Fah.), and it has no taste or odor after the evaporation of the volatile liquid with which it is impregnated.

## Correspondence.

### A New Route between America and Europe.

*To the Editor of the Scientific American:*

On page 294 of your current volume, I notice a proposed new route between New York and London. This route, I think, was first proposed by Sandford Fleming, C. E., when he conducted the preliminary survey for the Intercolonial Railway, about six years ago; and it was specially made on behalf of the upper provinces of the Dominion, and before the line was constructed from Bangor to St. John. I question whether Mr. Fleming now entertains the project. As a line from New York, it cannot compare with that which is hereinafter proposed. Although Shippegan is counted an excellent summer harbor, its value for such a purpose would be greatly reduced by the fact that it is only open about eight or nine months in the year. Then it would require to be connected with Bathurst with a branch of nearly fifty miles in length, which will not probably be soon constructed.

If the people of the United States wish to see the ocean traveling between the two continents reduced to a minimum, they can safely reckon on the lines of railway already constructed *vid* Bangor, Vanceboro', St. John, Sussex, Moncton, Amherst, etc., to Truro, and thence by branch to Pictou, instead of going to Halifax. From Pictou a line is contemplated to Whitehaven, or some other suitable port near the Strait of Canso, which would materially shorten the ocean voyage; or it would be better still to tunnel the Strait of Canso (this is believed to be quite practicable where it does not exceed a mile and a half in width), thence by railway (to be constructed) to Louisburg, a port said to be open all the year round, near the eastern extremity of Cape Breton and more than 200 miles nearer Europe than Halifax. Now Louisburg is much nearer St. George's Harbor than Shippegan, without being so far back in the cold; and with this connection by steamer, and a railway thence, say 250 miles, to St. John's, the great object would be accomplished. Perhaps a further improvement in this line could be secured. Should Aspy Bay, or some other point in the vicinity, prove to be a good ocean terminus for the railway, it would still further shorten the passage by water to Newfoundland. And this is the direction in which improvements should be looked for in the line of travel between New York and Europe. The tunneling of the Strait of Canso need not be regarded as a very formidable affair, after what has been accomplished at Mount Cenis and the Hoosac. The only other break in the proposed continuous line of railway would be at St. John's, where a good suspension bridge of 620 feet span, for ordinary traveling, now crosses the river. There a suitable structure for railway purposes is only a question of time.

Petitcodiac, N. B. GEO. W. MCCREADY.

### Preserving Zoological Specimens from Insects.

*To the Editor of the Scientific American:*

The difficulty of preserving zoological specimens from the depredations of insects is a matter of regret and anxiety to every collector, and various methods have been proposed for accomplishing this desirable object. The compositions into which arsenic and corrosive sublimate enter are well known to be very effectual when properly applied; but unless used with caution, they are apt to injure the natural pliancy of the skins, and are hardly effectual in protecting collections of insects. I have known these substances, even in the hands of the most expert, to produce such tenderness of the skins as to form a considerable obstacle in setting up specimens. To render them effectual they must be carefully applied to each specimen, by which the labor of collecting and preserving is considerably increased.

Every substance which I have tried seems inferior in efficacy and ease of application to the rectified oil of turpentine, and my method of using it is as follows: I put the turpentine in a bladder, the mouth of which is firmly tied with a waxed string; and nothing more is necessary than to place the bladder thus prepared in the box with the birds, or to tie it to the pedestal on which the birds are perched in a case. If there be any maggots on the birds, I have invariably found that they will soon be dislodged from the feathers, fall to the bottom of the case, and die in the course of two days. I have also made the experiment of introducing the common house fly, the large blue bottle fly, and moths into a case of birds so defended, through a small hole in the bottom of the case. The moment the flies enter the box they begin to vomit a whitish, glutinous matter, they are much agitated, and the largest of them dies in a few minutes. I have repeatedly introduced, in like manner, active cockroaches; and these strong insects soon became uneasy, often rubbed their sides with their hind feet, and usually died in about an hour and a half. I next got a bird skin full of living maggots and placed it in my defended case; in about three hours, they were seen coming out in all directions, and fell to the bottom of the case, where they died. For large cases of birds, a pig's or sheep's bladder is sufficient. The turpentine evidently penetrates through the bladder, as it fills the case with its strong smell.

New York city. G. W. B.

### A Remarkable Copper Spring.

*To the Editor of the Scientific American:*

Inclosed you will find a nickel five cent piece that was coated with copper, as you see it, by a spring in Monroe county, Tenn., in what is known as the Coker Creek gold region. I was traveling through the mountain regions of North Carolina and Tennessee this fall, and had heard a great deal of talk about the rich mineral resources of that part of the country, and had a great curiosity to visit it; and I was astonished to find such rich indications in the way of gold and copper. The spring which coated this coin with copper is a great curiosity; it ebbs and flows every twenty-four hours. In the evening it scarcely runs at all, but in the morning it runs quite briskly, and all around its border you can pick up small pieces of blue stone. There are also rich specimens of quartz in the same range. The spring is situated between the Chilhowe and Uanachacha mountains, about three miles from the North Carolina line, and about eighteen miles from the celebrated Duck Town copper mines. I was told that an English miner had been to look at it, and had offered fifty thousand dollars for the lot to one of the partners who owned it; but he went to Europe, and on his return he learned of his death, and did not know where the other partner lived. It is astonishing that such valuable mineral wealth should lie undeveloped when, by a little energy and capital, there could be made a large profit on the investment of time, labor, and money. JOS. YOUNG.

[REMARKS BY THE EDITOR.—The specimen sent by our correspondent consists of a nickel five cent coin, thickly covered with a deposit of copper.]

## THE ATMOSPHERIC RAILWAY IN LONDON.

In addition to thirteen miles of three inch bore pneumatic tubes, for sending telegraph messages between various stations, there is also in operation in that city a line of pneumatic railway, the capacity and operation whereof we find described as follows in a recent number of the London *Times:*

The pneumatic tube extends from the London and North Western Railway station at Euston square to the General Post Office in St. Martin's-le-Grand. The central station is in Holborn, where is also the machinery for effecting the transit of the trains. Here the tube is divided, so that in effect there are two tubes opening into the station, one from Euston to Holborn, and the other from the Post Office. The length of the tube between Holborn and Euston is 3,080 yards, or exactly a mile and three quarters, a greater length than was originally contemplated, but which was rendered necessary by the avoidance of certain property on the route. The tube is of a flattened horseshoe section, 5 feet wide and 4 feet 6 inches high at the center, having a sectional area of 17 square feet. The straight portions of the line are formed of a cast iron tube, the curved lengths being constructed in brickwork, with a facing of cement. The gradients are easy; the two chief are 1 in 45 and 1 in 60, some portions on the line being on the level; the sharpest curve is that near the Holborn station, which is 70 feet radius. The tube between Holborn and the Post Office is 1,058 yards in length, or 102 yards less than a mile, and is of the same section, and similarly constructed to the first length. The gradients of 1 in 15 occur on the Post Office section, but this steep inclination is in no way inimical to the working of the system.

The wagons, or carriers, as they are termed, weigh 22 cwt., are 10 feet 4 inches in length, and have a transverse contour conforming to that of the tube. They are, however, of a slightly smaller area than the tube itself, the difference —about an inch all round—being occupied by a flange of india rubber, which causes the carrier to fit the tube exactly, and so to form a piston upon which the air acts. The machinery for propelling the carriers consists of a steam engine having a pair of 24 inch cylinders with 20 inch stroke. This engine drives a fan 32 feet 6 inches in diameter, and the two are geared together in such a manner that one revolution of the former gives two of the latter, or, in technical terms, the engine is geared at 2 to 1 with the fan. The trains are drawn from Euston and the Post Office by exhaustion, and are propelled to those points by pressure. The working of the fan, however, is not reversed to suit these constantly varying conditions; it works continuously, the alternate action of pressure and exhaustion being governed by valves. The engine takes steam from three Cornish boilers, each 30 feet long and 6 feet 6 inches in diameter. Telegraphic signaling is carried on between the three stations by means of needle instruments.

The experimental working of the tube has already formed the subject of careful investigation with several engineers, whose opinions are highly favorable to the system. In the early part of 1872, Mr. W. H. Barlow, the consulting engineer to the Midland Railway Company, instituted a series of experiments with the pneumatic tube, which extended over several days. The results thus obtained led Mr. Barlow to the conclusion that the greatest working economy of the pneumatic tube was obtained in moving a great amount of weight at low speeds. In other words, with the same number of revolutions per minute of the engine and the same pressure, a very large increase made in the load produced a comparatively small decrease in the speed. In the Post Office section of the tube two gradients of 1 in 15 occur; but notwithstanding this, the heaviest loads were those which produced the best commercial results. Mr. Barlow's experiments showed that 20 tuns of goods were conveyed through the Euston tube in 8 minutes, and 12 tuns through the Post Office tube in 4¼ minutes. Hence, with the engine working on each tube separately, two trains of 12 tuns each might be brought through the latter tube in 9 minutes, and might be sent forward in one train of 24 tuns to Euston in about an equal space of time. That is to say, 24 tuns of goods might be conveyed through the entire length of the tube in 18 minutes, or, allowing a delay of six minutes at the station for shifting the trucks from one line to the other, the practical result would be the transport of one tun of gross load per minute.

The practical conclusions to which the preceding remarks point are that there exists at the present time, in good working order, a rapid and efficient means of transit for parcels between one of our leading railways and the Post Office, with an intermediate station. The system is now open to the public for the conveyance of goods, and the public are availing themselves of the benefit it confers. The comparatively limited extent of the district served means, of course, for the present, proportionately limited commercial results. It remains, however, for the Pneumatic Company to prove the soundness of their scheme by regular systematic working, and so to gain the confidence of the Postal authorities and the railway companies, to whom the pneumatic tube should prove a great boon. Useful as the system is as at present arranged, it requires but slight extensions to very materially increase that usefulness. It has already one of its termini at the Euston Station, and the proximity of the Midland and the Great Northern Stations at once suggests short extensions to both of those points. Again, the relative position of the Holborn Station with that of the South Eastern Railway at Charing Cross, and of the Post Office station with that of the same railway at Cannon street, would render an extension in either of these directions no very difficult matter, while all parties would apparently be benefited by the result. Then there are the district offices of the postal system, most of which might be placed in direct communication with the chief office by means of the pneumatic tubes, in the same way that, to some extent and by means of small tubes, the postal telegraph offices are connected at present time. Should the satisfactory results of of experimental working be borne out by the practical trial the system is now undergoing, there appears to be no reason why it should not be generally extended to all parts of the metropolis and the suburban districts.

### Railways in Great Britain and the United States.

The recent financial panic in the United States has naturally directed much attention to the railway system, which has been accused as the cause of all the disasters. It is not within our province to enter within the mere financial question, except so far as engineering enterprise may bear on it. The object of this article is chiefly to examine into the statistical history of the system, compared with our own, in regard to construction, population, commerce, etc., and thus to give prominence to certain facts which, so far as we know, have not hitherto been placed in such a position for the professional and general reader.

In 1830, there were but some 23 miles of railway existing in the United States; and at the end of 1872, there were 67,000 miles in existence.

In 1870-72 nearly 20,000 miles were constructed, or considerably more than the whole railway mileage of the United Kingdom at the present day.

The above statistics bear a striking contrast in rapidity of progress when compared with the extension of the British railway system. For example, in 1842 we had but 1857 miles; and in 1870 we had 15,540 miles, nearly. Between the end of 1864 and the end of 1872, the increase in the United States lines was about 33,000 miles, or just about double the total of British railways existing at the end of 1870. In other words, American enterprise had constructed, in eight years, double the mileage that we have effected in about forty years.

Next comes the question of the comparative cost of the two systems, and this is one of great importance in an engineering point of view. We are as nearly correct as we can be in stating that, while our 15,540 miles of railway involved by the end of 1870 a capital of $2,650,000,000, the 67,000 miles of United States railway cost only $3,150,000,000. The ratio of mileage is as 1 to 4·31; it consequently follows that, if the cost of the United States lines had been per mile the same as ours, the capital they would have involved would have amounted to $11,421,500,000. Taking the subject in another point of view, we shall find that, if the cost of our lines had been in the same ratio as that of the American lines, our expenditure would only have been some $730,000,000. Taking the cost per mile, the United States lines average 47,000, and here the contrast with us is very great. The cheapest constructed line in this kingdom is the Highland, which cost $61,300; the average is about $ 180,000 per mile. This would have confirmed our previous estimate of the cost as being over four times that of the United States, had we included shorter but more expensive lines in the United Kingdom. These figures have certainly a startling appearance, and this is increased if we take into consideration the difference of dividend that would have accrued to British shareholders had it been possible for the English lines to have been so cheaply constructed; but in considering this matter, the far larger proportion of single lines in the United States must be born in mind, while it must be remembered that the station buildings and general fixed plants of a large proportion of the cheaper American lines are such as would be quite incompatible with the traffic to be accommodated here.

In respect to the engineering department, the advantages the Americans possess are very great in the majority of cases. Stone and iron for solid work, and brick where it is easily procured, are the sole materials employed by us. In America, on the contrary, wood, which can be obtained at a much lower rate, was at first almost universally employed for bridges, stations, and other constructions. Another point of great importance is the fact that, while the great majority of American railways are only single lines, ours, with scarcely an exception, are double lines and now triple lines, as on the London and North Western, are becoming common where great traffic exists. The cost of earthwork of all kinds, bridges, etc., increases greatly with the increased

width, and the cost of the single lines would be much less, even if labor and material were at the same price in each case. Practically, the United States traffic is moderate, and spread over a large area of line, while ours is enormous, and spread over a very limited area. Hence, with us solidity and durability are of absolute importance, qualities which, as a rule, do not distinguish American railway construction.

Sleepers are an item of serious cost also with us; and the geological structure of our islands is such that cuttings, embankments, and tunnels are of constant occurrence, a level piece of line, except in the east of England, being of very rare occurrence. In the United States, on the contrary, the contracted contour of our country becomes expanded. Level plains are of enormous extent; and if there are obstacles, such as hills and mountains, the cheapness of land and construction permits a *détour* which would be simply ruinous, if not impossible, with us.

An interesting question, and one of great importance, as affecting railway enterprise, is that involving area, population, and commerce; and in this the comparisons between the United States and ourselves is remarkable. In 1861 our population was 29,321,288; in 1860, that of the United States was 31,443,321. In 1871, ours was 31,817,108, and that of the States in 1870 was 38,555,983. The latter, therefore, increased by seven millions, while our increase in the same period was about two and a half millions; the American increase was thus nearly three times that of ours. Comparing the respective areas, ours is 121,115 square miles against 3,034,459 of the States (exclusive of Alaska), of which about one fourth only is under civilization; but this area is six times that of ours, say 750,000 square miles. Our ratio per square mile is 250 persons against about 51 on the limited area just estimated. It results that, while both goods and passenger traffic is carried on in a compact area with us, the reverse occurs in the States. If precisely the same traffic took place for an equal population, at the same cost of material, wear and tear, etc., in both countries, it is evident that the States lines would be ruinously expensive. But fortunately for them the general cost of management and repairs is much less.

The management of the United States railways has been a subject of much complaint, and blame has been cast alike on engineers, directors, and other officers of the companies. We are not disposed to dip our hands into dirty water, of which abundance has been scattered about lately.

On the other hand, however, the resources of the country are enormous. Generally the soil is of inexhaustible fertility for the growth of corn, cotton, tobacco, etc. The forest districts afford endless supplies of almost every kind of useful and ornamental woods. In the mineral kingdom few valuable products are absent; coal, iron, copper, lead and most metals being found in abundance and frequently of the richest ores. All these natural products will tend to foster railway enterprise; and if this, in future, be restricted in its extension to the actual wants of the country, instead of its supposed distant necessities, it is impossible but that railway enterprise in the States can be other than of the most profitable and prosperous character at no distant period.—*Engineering*.

### Gas Purifier and Mixer.

M. D. Colladon says: Gas requires to be freed from particles of solid matter, naphthalin, coal tar, ammoniacal salts, etc., as well as from gases such as carbonic and sulphurous acids. For washing it, vessels have been employed similar to Woolf's bottle, in which the gas traverses water or a suitable solution through a metallic network, in the form of bubbles or continuous currents. This arrangement is insufficient for working on a large scale; because the bubbles of gas take a spherical form, and consequently present a minimum of surface for a maximum volume.

Further, this method requires a decided increase of pressure, which is inconvenient. The chemical cascades, in which the gas passes upwards through a fine rain of the washing liquid, act much better, but they require too large a quantity of liquid. Coke towers (scrubbers) produce a more complete effect, but the action is very irregular. The new mechanical washing apparatus has the advantage of producing very powerful action without requiring large dimensions. At Geneva it yields coal gas, superior both in illuminating power and in a sanitary point of view. Less purifying matter is also required than on the old system. The same apparatus will doubtless prove useful when it is required to saturate a gas with the vapors of a liquid, for example, hydrogen with the vapor of petroleum. The system rests on the principle that the best arrangement either for washing a gas or saturating it consists in making it strike, in the form of currents as thin as possible, against solid walls kept perpetually moist. The currents are broken against these surfaces, and are prevented from moving on in a straight line. The gaseous particles are thus always kept in a rotatory movement, and are pressed against the moist walls, so that they either absorb the substance diffused over these walls or may deposit there a part of their own substances, according as it is required to saturate the gas or to wash it.—*Chemical News.—Comptes Rendus.*

### New Method of Tempering Steel and Regenerating Burnt Iron.

M. H. Caron says: A piece of steel is generally tempered, and then reheated more or less according to the hardness nd the elasticity which it requires to receive. The dry temper, as commonly practiced, that is to say, plunging the red hot metal into cold water, has the drawback of developing cracks and crevices injurious to its tenacity. Reheating does not remove these flaws; and subsequently, on use, these fissures, though invisible at first, increase and terminate in fractures. It has already been discovered that, in order to escape danger, it is preferable to temper the steel a little softer and afterwards to reheat more slightly. The author has succeeded in producing the combined effects of temper and reheating in one operation, and of removing as far as possible the chances of flaws. This is done by heating the water, into which the red hot metal is plunged, to 55°. Tempering in hot, or even boiling, water modifies soft steel containing from two to four thousandths of carbon. This process augments its tenacity and elasticity without sensibly altering its softness. The texture is changed and becomes fiberous, even if previously crystaline. The author's method for restoring burnt metal is likewise to plunge it at a red heat into a hot liquid.—*Ibid.*

### New Dyeing Recipes.

[Reimann's Färber Zeitung.]

This number contains a recipe for a safflower rose on glazed calico. The dressing consists of 50 lbs. of wheat starch, 20 lbs. of wheat flower, 4 lbs. of white wax, and 6 lbs. of cocoa nut oil, a little sulphuric acid being added to the water in which the starch is mixed.

There are also recipes for light and deep Prussian blues on glazed calico; for a green (extracts of indigo and of quercitron) on jaconnet; a peach wood crimson on glazed calico and jaconnet; a brown on calico with Bismark brown and magenta; a gray drab on wool, and a scarlet on woolen cloth and flannel; also a blue (soluble aniline blue) and a coffee brown on plush; a violet on woolen yarn. The mordant in this case consists of 1½ ozs. of tannic acid, dissolved in hot water in which ½ oz. of Marseilles soap is next dissolved; ½ oz. rape oil is next added, and stirred up till it forms an emulsion. The liquid is used at 167° Fah. The bleached yarn is worked in this mordant for fifteen minutes, and then withdrawn. The color bath, at the same temperature, is prepared with 5 ozs. of alum and the clear solution of 1 oz. of methyl violet.

There is also a prescription for a light green on cotton yarn, the color being methyl green fixed with tannic acid.

The editor gives a recipe for a brown on shoddy containing a mixture of cotton, called on the continent *velour*. To 100 lbs. of this material, make up a bath of 30 lbs. of fustic, 3 lbs. of alum, 2 lbs. of prepared tartar, and 1 lb. of blue vitriol, in which the shoddy is boiled for half an hour. To the same fiot are then added 1 lb. of chromate of potash and ¼ lb. of aniline red, ruby, or aniline crimson, known on the continent as rosain. The dyeing is carried on at a gentle boil, and turmeric added to modify the shade. Logwood may be used, if needful, to darken. Aniline is refuse magenta; it is dissolved in hydrochloric acid and boiled in water previous to use.—*Chemical News.*

### Alleged Presence of Iron Filings in Tea.

In several cases of prosecution under the adulteration act which have recently been reported, the analyst has been able to demonstrate that a magnet thrust into a specimen of tea would attract certain particles which were stated to be iron filings, and held to be indisputable proof of a fraudulent admixture. That this inference is necessarily correct has, however, been disputed in more than one quarter. Mr. Treffry, of Exeter, England, writing to the *Grocer*, asserts that the mineral matter found in tea is not iron filings but a native magnetic oxide of iron, and he states that "it is probably titaniferous iron sand, which is very abundant in China." Mr. Alfred Bird, F. C. S., of Birmingham, says that he has separated particles of mica and quartz from the magnetic oxide of iron found in tea, his inference being "that, as magnetic oxide of iron forms part of the soil of China, it would rise with the dust of the country, and coming in contact with the damp leaves would adhere to them when they are dried, and thus make the dried leaves stick to the magnet as if there were iron filings mixed up amongst them." Speculative, to say the least, as this may seem, it would appear to receive some support from an experiment made by Mr. Bird upon some French bean leaves grown in his own garden. One hundred grains were dried, and upon testing with a magnet were found to be attracted by it in a similar manner to that reported of some specimens of tea leaves. A closer examination of the matter adhering to the leaves showed that it was magnetic oxide of iron, and 0·02 of a grain was obtained from the 100 grains of bean leaves. An investigation of the black mold of the garden in which the plants were grown showed that it contained an abundance of magnetic oxide of iron.

If all that the opponents of the adulteration act say against it were true, it would be but little to be able to reply that it is not an unmitigated evil; but still it is a fact that the act has given a great impulse to the investigation of food substances, the benefit of which must appear in an acquisition to our store of knowledge respecting this important subject. For even should Mr. Bird's speculations prove correct, it would not be the only instance that has recently come under our notice where the presence of a gross adulterant has been alleged upon insufficient grounds.—*Pharmaceutical Journal.*

DENTIST'S SOLDERS.—I. H. P. says: For gold solder, use 8 grains American silver coin and 4 grains best copper wire (or copper from an old style cent) to each pennyweight of gold plate of the same fineness as that to be soldered. For silver solder, use 8 grains best brass wire to each pennyweight of silver coin. Melt with borax, cool, and roll into plate.

THE Hoosac tunnel alignment proves to have been very accurately made. The error in vertical alignment was only nine sixteenths of an inch, and that in the level was one inch and a half. This result is very creditable to the engineers.

## SCIENTIFIC AND PRACTICAL INFORMATION.

### A NEW WEATHER VANE.

The old weathercock has three essential faults; it indicates a direction when there is a dead calm, it gives no means of learning the force of the wind, while it fails to show the true course of the same, by exhibiting merely its horizontal component. M. Tany proposes the arrangement to be attached to the ordinary lightning rod. Just above a suitable shoulder on the latter is placed a copper ring, grooved and made into a pulley easily rotated in a horizontal plane. Around this passes a knotted cord, the ends of which are secured to the extremities of a short stick or metal rod, to which is secured a simple streamer. Thus constructed, the vane indicates a calm by falling vertically, and besides shows the strength of the wind by being blown out more or less from the lightning rod. As is evident, it is capable of motion in every direction, so that if there exist in the wind an upward tending vertical component, the same will be shown.

### NEW MODE OF SHOWING NODAL POINTS IN SOUNDING TUBES.

Bourbouze proposes, as an improvement upon the Kœnig capsule generally used for the above purpose, the employment of a simple membrane of rubber on which is attached a very light silvered mirror which oscillates with it. If rays from a luminous point be reflected upon the mirror, and the image passed through a lens, the image is lengthened, and often transforms itself into an ellipse. It reaches its maximum elongation when the mirror is placed at a node, but retains its immobility when reaching the points corresponding to ventral segments. The device, it is stated, can be placed at the extremities of Helmholtz's resonators, or of the rubber tube attached to these instruments, and the mirror vibrates when a mixed sound is produced, containing the note proper to the resonators, to which it is applied.

### AQUEOUS EXHALATION OF PLANTS.

M. Barthélemy, after a series of experiments on the above subject, concludes that in plants there is an insensible exhalation throughout the entire cuticular surface, through the medium of a true gaseous dialysis; that there is an abrupt emission of saturated gases which escape by breathing apertures when the plant is submitted to a rapid elevation of temperature, especially when under a bell glass; and that there is finally an accidental exudation, the result of defects in equilibrium between the absorbent action of the roots and the work in the aerial portions for the fixing of the carbon added to the elements of the water, a labor which ceases when light disappears.

### SIMPLE METHOD OF DETECTING ADULTERATION OF WINE.

Into a small quantity of the wine to be tested, says *Le Temps*, drop a piece of potash. If no deposit is formed, and the wine assumes a greenish tint, it has not been artificially colored. If, however, a violet deposit appears, elder or mulberries have been used. If the deposit be red, the adulteration is sugar beet; if violet red, campeachy wood; if violet blue, privet berries; if clear blue, coloring matter obtained from sun flowers.

### IMPROVEMENT IN PHOTO-LITHOGRAPHY.

M. Paul proposes the substitution of albumen for gelatin in the bichromate process. The paper is covered with a thin layer of albumen, to which a concentrated solution of bichromate is added. After sufficient exposure under the negative, the sheet is covered with lithographic ink and then immersed in cold water in order to dissolve the unaltered albumen, which is removed by fine sponge. A very clear image, it is said, is thus obtained, ready to transfer to the stone.

### PHYSIOLOGICAL PROPERTIES OF CAFFEIN.

The physiological action of coffee, according to MM. Aubert and Haase, should not be attributed to caffein, but to other principles. An injection of 0·6 cubic inch of coffee containing 0·6 grain of caffein killed a rabbit in a very short time, producing acceleration of the pulse and respiratory organs, uneasiness, and finally convulsions. An injection of 0·75 grain of pure caffein, however, did not produce death nor even any symptoms of sickness. An infusion of 770 grains of very hot coffee, corresponding to 6·3 grains of caffein, acts upon a man far more intensely than a stronger dose of pure caffein. Headache, vertigo, trembling, and similar symptoms are produced, which last upward of four hours. Coffee extract, deprived of caffein by chloroform and injected into the jugular vein of a rabbit, causes strong convulsions, but never tetanus, such as is produced by an overdose of caffein singly.

JAMES VICK, the Rochester (N. Y.) seedsman and florist, informs us that he manufactures and sells the tent roof garden chair illustrated in this journal some time ago. It will be remembered that we recommended its introduction in this country. We are glad that our suggestion has been anticipated.

MR. A. PELL desires such of our readers as have old numbers of the SCIENTIFIC AMERICAN which they do not want, to send them to No. 18 East 30th street, New York city. Any papers sent will be distributed in the Bellevue Hospital and other charitable institutions, where they are frequently asked for and eagerly read by the patients.

A STRONG colony of bees has been known to build one hundred square inches of comb in twenty-four hours; at that rate, over sixty sheets of comb a foot square could be constructed in three months. The *Annals of Bee Culture*, mentions a swarm that built nine sheets of comb, ten by thirteen inches, in ten days.

### THE CRYSTAL SELF-ACTING TABLE FOUNTAIN.

Nature's ornaments are the standard of beauty; and the more closely art copies her ever varying forms, the higher and purer does it become. A spray of ivy creeping over a cornice, a handful of flowers, not imbedded in a stiff mass but allowed to rest loosely in a simple vase, a jet of crystal water dancing and playing like a shower of diamonds in some sunny corner, are far more exquisite than the most elaborate decorations or gorgeous fittings that the most skillful of workmen can produce.

Fig. 1

But nature may be assisted by art, so that her handiwork may exist in places where it would otherwise be absent; and the ingenuity of the inventor is not at a loss to find a way of bringing into our parlors the beauties which we admire in the garden. Such indeed is the object of the ornamental little device to which our engravings refer, and by which we are enabled to place a miniature fountain, with its floral accompaniments, in the center of our dining tables, if we so desire it. Apart from its beauty as an ornament, it may here be noted that a jet of water in the room tends toward moistening the atmosphere, and relieving it of the dry nature especially due to furnace heat, while, besides this, the fluid has a tendency to absorb the foul gases due to respiration. Hence the invention is desirable both from an esthetic and a sanitary point of view, while it has, as we are informed, the further merit of being within a moderate limit of cost.

In our illustrations, Fig. 1 shows the apparatus entire and Fig. 2 is a vertical section. There is a pedestal, which may be of imitation bronze or any other desired material and made in any handsome design. In this is a cylindrical space in which fits a heavy plunger, A. Through the latter is an opening into which passes a rubber pipe, B, of smaller diameter, and which terminates below in a flap valve. The valve, however, is pierced, so that the opening from the water below, through the pipe and to the spout above, is clear.

Fig. 2.

To start the fountain, in which clear, colored, or perfumed water, or even *eau de cologne*, may be used, the plunger is drawn up to the highest position by means of the chains which connect with the movable metal tulip buds, C. While this is being thus elevated, the water above passes through the annular space between the pipe and the periphery of the orifice in the plunger, and escapes below, the valve, of course, opening downward. The plunger, however, on being left to itself, descends by its own gravity, pressing upon the water below, which, unable to ascend through the annular space on account of the closing of the valve, is forced through the small central opening in the latter, through the pipe, B, and, finally, out at the spout in a fine jet sixteen or eighteen inches high. The basin communicating with the cylinder, of course, never overflows, and the play of the fountain continues until the plunger has reached the bottom, which, with a small jet, occupies a period of about forty-five minutes. The lifting of the plunger is very easily done, and is hardly two seconds' work. The glass tulip shown near the jet is designed to hold flowers, and the same are also arranged in holders attached to the side of the basin. By being continuously sprinkled with water, they are thus kept fresh for quite a long time. At the bottom is a conduit and cock for drawing off the water, and a suitable strainer is provided at the jet to prevent the same from clogging.

The decorations are quite tasteful, and the ornament, as a whole, will be a handsome addition to any parlor.

Patents for the fountain are now pending. For further particulars, address the American Fountain Works, New Haven, Conn.

### COMBINED EXTENSION MEASURING ROD AND DIVIDER.

The object of the invention herewith illustrated is to facilitate the taking of measurements between rigid surfaces, and the striking of circles, arcs, ovals, or ellipses. It appears to be quite a handy little instrument, and will doubtless prove a convenient device for builders and mechanics.

There is a center piece, A, Fig. 1, in each of the two opposite sides of which is made a dovetail groove for the reception of metallic dovetails attached to the inner sides of the extension pieces, B and C. This arrangement is clearly shown in section in Fig. 3. Secured also to the center piece are suitable bands for holding the extension arms, which are provided with thumbscrews, so that the latter may be fastened in any desired position. The pieces, B and C, are graduated in inches and fractions, so that the length of the rod may be at any time easily ascertained. At D is a removable point secured by a thumbscrew, and at the opposite

Fig. 1

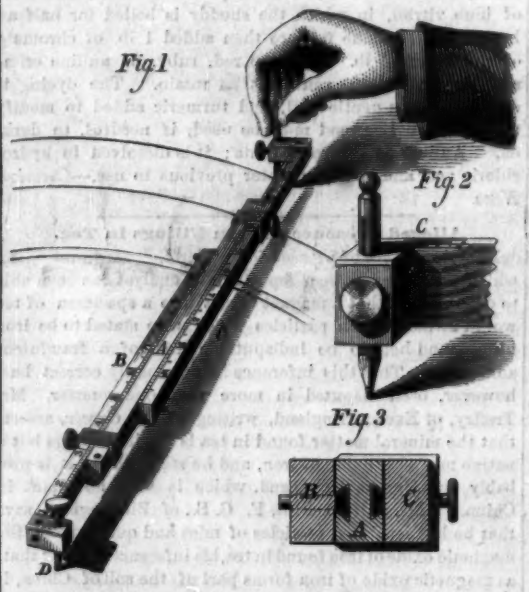



Fig. 2




Fig. 3




extremity of the apparatus, shown in Fig. 2, is a simple arrangement for holding an ordinary pencil. The mode of using the device for striking circles is obvious from our engraving. In making ellipses, the third point is attached to the end of the center piece. When not used as a tram, the points and pencil may be disposed of in suitable holes made in the ends of the pieces.

Patented through the Scientific American Patent Agency, November 4, 1873. For further particulars address the inventor, Mr. George H. Discher, Mobile, Ala.

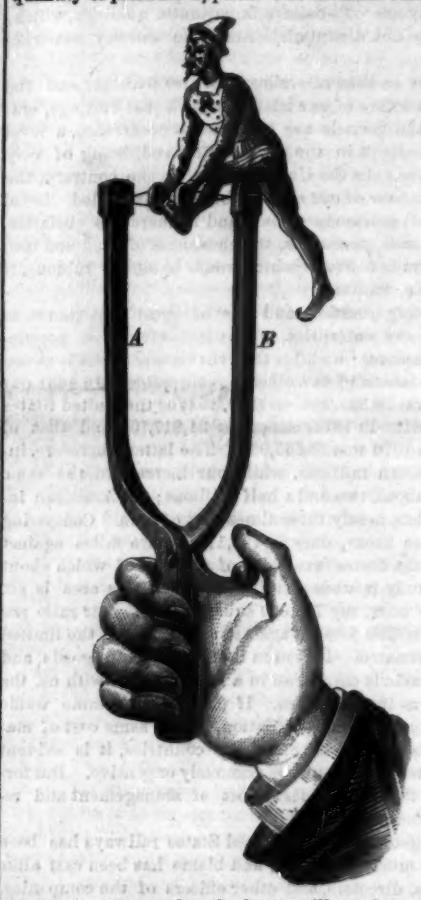
### The Sea Mouse.

The sea mouse is one of the prettiest creatures that lives under the waters. It sparkles like a diamond and is radiant with all the colors of the rainbow, although it lives in the mud at the bottom of the ocean. It should not have been called a mouse, for it is larger than a big rat. It is covered with scales that move up and down as it breathes, and glitters like gold shining through a flocky down, from which fine silky bristles wave that constantly change from one brilliant tint into another, so that, as Cuvier, the great naturalist, says, the plumage of the humming bird is not more beautiful. Sea mice are sometimes thrown up on the beach by storms.—*Hearth and Home.*

### TOY GYMNAST.

This is one of those ingenious mechanical toys which are sure to amuse and please children of all ages, though it it is nothing but an articulated figure which, supported between two upright bars, goes through a variety of ludicrous antics. The performer is made of pasteboard, and has his legs and arms pivoted to his body. The hands are kept apart by two short tubes through which pass a couple of strings which are secured to the tops of two bars, A and B. Bar A is curved and projects downward into the handle. The other, B, is also curved, and its lower end terminates in a thumb piece, which enters and is pivoted in a groove in the upper part of the handle of bar A.

All that is necessary to do in order to make the figure execute a number of astonishingly impossible gymnastic feats is to press down the thumb piece, as shown in our engraving. By this means, the upper ends of the bars are forced apart, and the motion of the gymnast regulated according to the quantity of pressure applied. The inventor also adds hooked




toes to the feet, so that the latter will catch in the tubes between the hands, and thus give the performances of the figure a more grotesque appearance. This is just the article to find ready sale during the holidays.

It was patented November 18, 1873, through the Scientific American Patent Agency, by Mr. Frederick A. Bancker, of whom further particulars may be obtained by addressing P. O. box 180, Brooklyn, N. Y.

### MOISTENING DEVICE FOR LAME ANIMALS.

Mr. George J. Harris, of New York city, has recently patented an apparatus by means of which the legs or feet of a horse, or other animal, may be kept moist for any desired time. He arranges an india rubber water bag around the neck and leads therefrom flexible pipes, which extend to the legs of the animal. These pipes, at A, are connected to tubular sprinklers, which are so constructed that they can be conveniently secured either below the knee or below the ankle joint. They are also perforated with a number of

minute holes, and are enveloped in flannel or other suitable absorbent material, so that water or liniment, which oozes slowly out, is distributed over the entire surface of the legs or feet.

By this means a sufficient quantity of liquid is supplied to keep the extremities of the animal damp for a considerable period of time; and when the device is once adjusted, it needs no further attention until the receptacle is empty.

### CHINESE FRESH WATER FISH.

There is a common belief that the queer animals represented in the grotesque designs of Chinese artists are in the main chimerical, and have no existence save in the imaginations of their delineators. It is a fact, however, that the reverse is, in some instances, the case, and that many of these beings really live, though perhaps in a form hardly so exaggerated as depicted in the works of celestial art. A French pisciculturist, M. Carbonnier, has recently succeeded in transporting several strange varieties of fish to France, and, as we learn from *La Nature*, has found it possible to acclimatize them, and hence to study their habits of life, reproduction, etc. Four species of these odd animals are represented in the accompanying engraving. The pair nearest the surface of the water are *macropodes*, small fish, pale gray in color, and, at first sight, having little about them to attract attention. As soon as the animal becomes excited, however, the long fins on the back and belly straighten out and assume a rich purple hue tinted with green; the long and fork-shaped tail spreads into a kind of fan, and the stripes upon the sides of the fish become yellow, red, and blue, constantly changing in color. The scales seem to become opalescent, and reflect the light with the greatest brilliancy, while the eyes appear illuminated with a bluish green fire. These beautiful peculiarities of the fish have gained for it the popular name of Fish of Paradise.

The habits of the animal are as odd as its appearance. The males take charge of the young and build the nest. The latter is simply a clot of foam floating upon the water, and is made by the fish rising to the surface and alternately absorbing and expelling air, until a little cluster of fine bubbles, hardly three tenths of an inch square, is formed. The female then deposits her eggs, which are at once seized upon by the male, who carries them in his mouth to the nest. Then he watches their incubation, carefully guarding and distributing them with wonderful sagacity evenly throughout the mass of foam. When they clot together, he pushes them apart with his nose, and, besides, keeps up a continual manufacture of bubbles until the eggs are lifted up above the water and rest only upon their soft couch. As soon as the embryos appear, his care is doubled. He watches that none escape; and in case some become separated, he chases them, catches them in his mouth, and replaces them carefully in the nest. If one becomes injured, he removes it from the others, and gives it a separate air bubble to itself, and apparently nurses it until it regains strength.

The *macropodes* belong to a family known as *labyrinthiform pharyngiens*, and their peculiar construction enables them to keep their gills moist for a very long time. They can pass through half dry marshes by maintaining their equilibrium with their fins and propelling themselves by the sharp toothed points with which the latter terminate.

The two grotesque-looking fish represented in our engraving, just below the *macropodes*, are of the genus *cyprinus*, and are termed telescope fish. The body is apparently gilded on its lower portion and of a deep velvet black above, while its form is globular. The dorsal fins are double, and the tail extends into a long curved fan. The eyes project sometimes as far as an inch and a half beyond the head, and resemble the lens and tube of a telescope. The habits of this strange animal are as odd as its shape, and it is said that its equilibrium in the water is very unstable, so that it even swims with difficulty.

The two species shown near the bottom belong to the same genus *cyprinus*, and are known to science as the *leuciscus idellus* and the *hypophthalmichthys molitrix*. There seems to be nothing extraordinary about the habits or form, and the value of the fish lies in its quality as food. Its flesh is said to be excellent, and the animal, when adult, often attains a weight of fifty pounds. The Chinese raise these fish in great numbers in artificial ponds.

CHINESE FRESH WATER FISH.

### How the Heathen Chinee catches Fish.

M. de Thiersant, lately a French consul in China, has published in France a quite interesting work on pisciculture and the mode of fishing in that country. He states, among other facts, that over 850 different kinds of fish exist in Chinese waters, many of which are of species hitherto unknown to European naturalists. Several varieties have for centuries been selected as fit for food and cultivation, and hence pisciculture or the ordinary domestic raising of fish, an industry here in its infancy, is far from a novel idea in the Celestial Empire. The author presents a vast number of interesting details on his general topic, from among which we select the following curious ideas:

The cormorant is largely employed as an assistant to the fisherman, and is carefully educated to its work by professional trainers. When thoroughly trained, a pair of birds is worth 40 dollars, the high price being explained by the cost and labor of instruction. During the first seven months of its life, the cormorant is left with the flock and is taught by its elders how to feed itself on small fish. After that age however, a collar is fastened about its neck so that it cannot swallow its prey, and to one of its feet a cord some two feet long is attached, terminating in a bamboo float. At a signal from the fisherman, whose sole implement is a forked stick some ten feet long, the cormorants plunge into the water and search for fish, each bird, as fast as he catches one in his beak, rising to the surface. The fisherman then hooks the bird's float with his stick and draws it towards him, taking the fish away from the cormorant as soon as it comes within reach of his arm. When the fish is very large and weighs seven or eight pounds, for example, the cormorants will assist each other, one catching the fish by the tail, another by the head, etc. They rarely catch anything weighing less than a quarter of a pound. After every capture a small bit of fish is thrown to the bird as a reward, the piece being sufficiently little for it to swallow in spite of its collar. Chinese fishermen keep their feathered assistants at work as long as daylight lasts. Occasionally the birds become tired and refuse to dive, a proceeding which occasions a series of frightful yells and beating of the water with a stick by their master, which frightens them to such an extent that they resume labor instantly. This mode of fishing, which is not interrupted even by severe cold, is quite lucrative, as twenty or thirty birds can readily catch about a dollar and a half worth of fish per day. In general the fishermen are associated, and the birds belong to a society which marks them with a peculiar brand of its own. Oil of sesame is said to be the panacea for all ills of the cormorant, which continues its career of active work until about ten years of age.

The Chinese have also queer ways of catching water fowl. Sometimes they spread great vertical nets with large meshes near the surface of the water, so that the wings of the birds become entangled therein just before they alight. Another arrangement is a sort of net trap held open by the bamboo sticks which, when the birds perch upon them, fall and allow the game to become entangled in the meshes. Perhaps the most ingenious idea is carried out by men who enter the water entirely nude, wading in up to their necks. Over the head is placed a sort of helmet, which is pierced with holes for sight, breathing, etc.; and resting on the man's shoulders is a wooden shelf on which, just in front of the sight orifices of the helmet, is placed a number of cups containing corn or seed. The bird, attracted by the bait, alights upon the shelf, when the fowler grabs his prey by the legs with his hand, draws it under the surface, and secures it in a net bag which is worn about his waist.

### Hairy Men.

Two remarkable instances of hairy men arrived recently in Berlin. They are Russians, father and son, and have excited so much interest that Professor Virchow has delivered a lecture upon the phenomenon, an abstract of which appears in the *Edinburgh Medical Journal*.

They are peculiarly remarkable in being edentulous. They are not hairy men in the ordinary acceptation of the term, but more resemble some of the monkey tribe (the Diana monkey, cuxio, etc.); while their edentulous condition carries them yet lower in the animal scale. The eldest is a man aged over 55, Andrian by name, said to be the son of a Russian soldier from the district of Kostroma. He was born during the period of service of his reputed father, and has no resemblance to him, to his mother, or to a brother and sister whom he possesses. To escape the unkindness of his fellow villagers, Andrian fled to the woods, where he lived in a cave, and was much given to drunkenness; even yet he is said to live chiefly on sauerkraut and schnapps; but his mental condition, which is truly none of the sharpest, does not seem to have suffered, and he is, on the whole, of a kindly disposition, and affectionate to his son, and to those about him. Andrian was married, and had two children, who died young; one of these was a girl resembling her father; but of the other, a boy, nothing can be ascertained. Fedor, the boy, exhibited with him, is three years old, and comes from the same village; he is said to be Andrian's son, born in concubinage; and it is most probable that this is the case, as it would be singular were two such creatures to originate independently in one small village. The peculiarity of these individuals is that they have an excessive growth of hair upon one particular part of the body, namely, the face and neck; on the body and lower extremities there is also a stronger growth of hair; and particularly on the back and arms of the child, there are sundry patches of 0·15 inch to 0·24 inch in diameter, covered with soft yellowish white hair 0·12 to 0·24 inch long. Andrian himself has on his body isolated patches strewn, but not thickly, with hair 1·5 inches to 2 inches long. But all this is trifling and subordinate compared with the hair growth on the face, to which attention is mainly directed. Andrian has only the left eye tooth in the upper jaw; Virchow has not stated how many teeth are in his lower jaw, but from the

context it is improbable that he has more than his son, namely, four incisors. The son has no teeth, hardly any alveolar process, and the upper lip is very narrow, so that the upper jaw appears depressed; the father presents the same appearance. It is somewhat singular that a similar family has long been known to exist at Ava, and was first described by Crawford in 1829, and since then by Beigel. Three generations of this family are now known to exist. The grandfather, Shwe-Maon, had a daughter Maphoon, and she again a son, all of whom present precisely the same peculiarities as in the family of Andrian, not only as to the growth of hair, but also as to the teeth. The grandfather has in the upper jaw only four incisors, in the lower jaw four incisors and one eye tooth; and these teeth did not appear till he was twenty years of age. Maphoon has only four incisors in each jaw; the eye teeth and molars are wholly wanting; the first two incisors appeared during her second year. The peculiarity of the hairiness in these individuals is of the same type as in Adrian and his son, in whom every part of the face and neck, usually only covered with lanugo, is covered with long hair, the very eyelids being so covered, the eyelashes being normal, while flowing locks come out of both nostrils, and also out of the *meatus auditorius externus*. At first sight, the occurrence of two such families in two such distinct parts of the world, seems to point them out as "missing links"—as the unreformed descendants of an earlier race of man. And our thoughts are carried back to the Ainos or hairy Kuriles, who are believed to be the remains of the aborigines of Japan, and who now inhabit the northern parts of the Island of Yesso and the southern part of the island of Saghalien. At first these aborigines were stated to be as hairy as our wild men; but from more accurate information, obtained by the Berlin Anthropological Society through the German resident Herr Von Brandt, accompanied by numerous photographs and Japanese pictures of these Ainos, and from an examination of a skull recently obtained through Privy Councillor Von Pelican, Virchow is able to state with positiveness that, neither in respect of the formation of hair nor in regard to the teeth, have the Ainos any analogy with the Russian or Burmese hairy men. The Ainos are certainly hairier on the chest and extremities than the nations around them, but there is nothing peculiar in the distribution of the hair, and the males have hair only on the typical parts peculiar to man. There is not a shadow of a race connection between the Ainos and the Russian hairy men, and only the most prurient imagination could connect the latter with the Burmese family. No doubt, careful breeding could raise a new race of men from this accidental variety, just as various new races of domestic animals, dogs, for instance, have been propagated from accidental varieties. Virchow, however, believes that the peculiarities, belonging to the Russian as well as to the Burmese families, depend upon idiosyncrasies of innervation, and these upon accidental congenital abnormalities in the *trigeminus*, within whose domain all these features present themselves, only to be ascertained by careful dissection.

## Recent American and Foreign Patents.

### Improved Scrubbing Brush.

Carl Herold, formerly of Pittsburgh but now residing with Mr. Vock, 33 Ludlow street, New York city.—This invention is designed to furnish a scrubbing brush which contains a reservoir to hold water, soapsuds, or other cleansing liquid. This reservoir is in the brush back, in which a small air hole is made, the closing of which by the finger, while the brush is in use, will stop the flow of the liquid; or the hole may be provided with a valve. The improvement may be applied to blacking brushes, for which it is especially suitable. Further information may be had by addressing Mr. Herold as above.

### Improved Grain Separator.

Joseph Koons, New Auburn, Minn.—This invention is an improved grain separator, so constructed as to thoroughly separate the grain from the straw as they come from the thrasher, clean the grain and remove it, and carry the straw out of the machine and deposit it upon the stack. The frame of the machine is rectangular in form, and is incased upon its top and sides. The frame is from twelve to fourteen feet long, about four and a half feet high, and from three to four and a half feet wide. Two shafts revolve in a side bar, and to each are attached two wheels, which work in circular spaces in the casing of the machine, so that the straw and grain cannot escape. The wheels are connected near the rims, at their upper and lower parts, by two rods, the points of attachment of which form an angle with each other of one hundred and sixty degrees. The upper rods connect with the separating rack, the slats of which are provided with teeth, inclining forward, so that as the rack moves upward and forward it may carry the straw with it and may slide beneath the straw as it moves downward and rearward. By this construction, as the shafts are rocked, the rack receives the vertical and horizontal movements necessary to properly separate the grain from the straw and carry the straw forward. To the lower rods is attached the conductor which receives the grain from the rack and conducts it to the sieves. To the forward end of the conductor are attached fingers to break up the sheet of grain as it falls to the shoe or sieves. The conductor has the same vertical and horizontal movement as the rack. By suitable mechanism, the horizontal and vertical movements of the rack and conductor may be regulated at will. This adjustment enables the forward movement of the straw to be accelerated or retarded, as required.

### Improved Corn Planter.

Charles Hutchins, Aubrey, Kan., assignor to himself and Abram Large, of same place.—The seed-dropping mechanism consists of a slide which moves in guide slots of the hopper, at the bottom of the same. The slide is arranged with a hand spring, to which is connected a lug which is acted upon by knobs attached to the spokes of the wheels, according to the distance at which the corn is to be planted. The knobs carry the spring and slide forward, and drop the seed inside of plow to the ground. As soon as the spring is released, the slide closes the hopper till actuated again by a knob. Cross pieces are attached to the circumference of wheels diametrically opposite to the knobs, for the purpose of marking the exact place at which the corn has been dropped. The driver is thereby enabled to see at any time whether he is planting in rows or not. As soon as he finds himself not exactly in line, he can, by placing his foot on the lever, raise the front wheels on the pivots, and regulate the planting by simply turning the wheels forward or backward, which allows him to plant as straight one way as the other. The broad concave hind wheels are placed back of the plows, and serve to cover the corn dropped in the furrows. By means of a lever which is operated by the foot of the driver, the pivoted frame with the wheels is raised, and thereby the planting interrupted at will, as required | during the planter or moving from place to place.

### Improved Reciprocating Engine.

Samuel J. Jones, Helena, Montana Ter.—The piston rod extends through both cylinder heads, and disks fit thereon, one each side of the piston, and work airtight in the cylinder. On the upper side of the latter are induction ports for the air, and valves for opening and closing them, which are connected by a valve rod. Short rods project into either end of the cylinder, by which the levers are thrown to work the valves, by means of the disks, which strike the rods when forced against the cylinder heads. The steam ports are on the lower side as is also an injection port for water, to condense the steam after having thrown the shuttle to expel the air through the clack valves and shift the air valves. Supposing the engine to be standing with its piston at its forward end, and the valve shifted to admit steam at the front port, the rear disk will thereby be driven to the other end of the cylinder, expelling the air; and just before arriving at the piston head, it will strike the short rod at that end, and close the right hand air port, and open the left hand port; at the same time, if the injecting port be opened and water admitted, the steam will be condensed and a vacuum formed, so that the air admitted will drive the piston and other disk over to the right, with all the force due to the difference of the pressures on the two sides of the piston, which, in practice, will probably be about twelve or thirteen pounds to the square inch. At the same time the injection port should be closed to shut off the water; then if steam be admitted between the rear disk and the piston, it will be driven back to the left, expelling the air and water at that end, and taking their place to form a vacuum again by being condensed by water admitted; so that, as soon as the rear disk arrives at the end of its movement and strikes the rod, the air would be admitted behind the piston, and drive it back to the place of beginning, and so on.

### Improved Safety Valve.

James Hoffman, Belvidere, N. J.—A short vertical pipe rises up from the top of the steam chamber, having a considerable enlargement near the upper end, which is bored out cylindrically, and, at a suitable distance above the bottom, perforated with numerous holes. The safety valve proper is seated at the top of the small bore of the pipe, and is provided with a cylindrical attachment fitted to the bore, as nearly steam tight as it can be and work up and down a short distance without friction. After the steam has lifted the valve, it cannot escape until the attachment rises as high as the lateral holes. By this means, the lifting of the valve high enough to insure the opening of the escape to the full capacity of the bore will be caused.

### Improved Wood Molding.

Leonard Bushnell, New Bedford, Mass.—This invention consists in a wooden or other molding, provided with stamped ornamental figures or signs in intaglio, having the sides of the recesses beveled and inwardly inclined, to facilitate the operation of gilding.

### Improved Wheel for Vehicles.

Joseph H. Glover, Freedom, Ky.—An octagonal tube has a screw thread cut upon each end, and is lined at each end with antifriction metal, to form the bearings for the axle. The two hubs have octagonal holes formed through their centers, to fit and slide upon the tube; and in their outer sides are formed dovetailed recesses to receive the dovetailed inner ends of the spokes, which are kept in place by plates bolted to the hubs. The inner part of the plates is rabbeted to receive the flange formed upon nuts, which hold the hubs and plates in place, and also move said hubs and plates out and in. The corresponding spokes from the two hubs meet at their middle parts, and their outer parts are connected together. The outer ends of the spokes have tenons, which enter holes in a rim, which is made convex upon its inner side and concave upon its outer side, which construction prevents the wheel from slipping. By this construction the spokes are shortened by spreading their inner forked ends apart by turning the nuts outward. This shortens the spokes and loosens the rim. By turning the nuts inward, the inner ends of the forked spokes will be moved toward each other, the spokes will be lengthened, and the rim tightened.

### Improved Car Coupling.

Xavier St. Pierre, Ophir City, Utah Terr.—This invention consists of a pair of spring jaws, side by side, with heads or enlargements near the front end between which a double headed coupler enters. The latter is secured by the heads of the jaws engaging it behind its enlargement, the jaws being confined against springing open by a forked locking key, which drops down with one of its prongs on each side. The forked locking device is raised and lowered by a handled elbow lever; and a catch is combined with said lever, to engage it just after it has raised the locking device, and hold it up until the cars are to be coupled again. This catch is so coupled with one of the spring coupling jaws that, when it is swung back by the lever to allow it to pass beyond said catch, the latter is caused to withdraw the said coupling jaw, to allow the coupler to escape freely and uncouple the cars. A spring is combined with the elbow lever of the locking device, to insure the return of the latter to confine the coupling jaws when the elbow lever is released by the spring catch.

### Improved Overalls.

Emil Weil, New York city, assignor to Stern & Co., of same place.—The object of this invention is to furnish overalls readily applied without the use of buttons, suspenders, etc., fitting the body of the person, and self-adjusting to the position of the same. It consists of short elastic bands, inserted and applied into the band piece of the overalls, and closed by a common belt buckle, which is drawn through a slit of a flap attached to the lower front edge of the overalls, and covered by the same.

### Improved Apparatus for Puddling Iron.

Joseph Davies, Knoxville, Tenn.—On the rod or shaft of the puddling tool is a pulley for revolving it. The pulley is fitted by a journal at one end in a bearing in a standard, and the shaft is fitted in the pulley so as to slide freely endwise, and has a long key or spline working in a groove in the pulley, to be revolved at the same time. The standard is jointed to a section which is seated by a collar on the bench, and has a cylindrical extension passing down through a long slot in the bench top, which is secured by a pin. The bench ranges parallel with the front of the furnace, and is pivoted just above the ground so as to swing toward and from the furnace. The handle portion of the puddling tool rod does not revolve with it when held by the attendant for directing the tool. It will be seen that the tool can be moved in and out by sliding in the pulley in which it is supported; also, by swinging the bench forward and backward on the pivots, that it can be swung horizontally on the bench by turning the section of the support, and that it can be shifted along the bench parallel with the furnace, and thus all necessary movements can be made to work the tool in all parts of the furnace to manipulate the iron for puddling and balling.

### Improved Portable Stove.

Rice Moore, Nashville, Tenn.—This invention relates particularly to the arrangement of a damper and apertured horizontal diaphragm in an upper chamber of the stove, whereby the course of the heat and products of combustion is controlled with reference to their effect on a culinary vessel set into said chamber. A small vertical rectangular case is mounted on short legs and contains a fire pot, flue, oven, and chamber. The fire pot extends downward a little below the bottom of the other portion of the stove, and has a perforated bottom and sides. The combustion chamber extends up through the oven space at one side, and discharges into the heating chamber, and a door opens into it for supplying the fuel. On the side of the stove opposite to the fuel door is the oven door. The boiling and stewing vessels are made long enough to extend through the heating chamber into the oven, through the top, to utilize the heat of the oven for boiling, stewing, etc. A plate is arranged in the chamber, parallel to the top of the oven, dividing it horizontally into two parts. Immediately over the combustion chamber said plate has an opening which can be partially closed by a sliding damper. By adjusting the damper, a large share of the products of combustion will be diverted to pass beneath and around the end of the plate before reaching the flue, while the remaining portion will pass vertically into the same through the openings on each side of the damper.

### Improved Tomb.

Joseph C. Taylor, Roanoke, Ala.—This invention has reference to a tomb or grave cover which is composed of a base or pedestal of masonry, upon which is placed a slab of artificial stone resembling marble, formed by molding upon said base a composition of hydraulic cement, sand, and water, or their equivalents.

### Improved Horse Power.

John S. Tadlock, Belmont, Texas, assignor to himself and J. M. Howell, same place.—This invention relates to railway horse powers; and it consists of cog wheels on the drums over which the endless chain travels, gearing with large multiplying wheels, one on each side of the chain. Between these wheels is a drum on the same shaft, on which the chain rests, so as to be carried in returning to the upper side; and the multiplying wheels are geared with a counter shaft having pinions and transmitting pulleys, from which the motion is taken by belts. The frame supporting the endless chain rests by the wheels of its drums on the large multiplying wheels, and can be shifted so as to ascend from either side, to run the machine in either direction, and to change the inclination for varying the speed. The drums of the endless chain are weighted to prevent them from jumping out of gear with the multiplying wheels.

### Improved Apparatus for Filling Cans with Tomatoes, etc.

Charles S. Bucklin, Red Bank, N. J.—There is an inclined tube, tapering or funnel-shaped, at its lower end, which terminates in a small pipe. An adjustable can holder is placed in front of the end of the tube and provided with a movable cut-off plate. In the tube is a piston, connected with a counterpoise. The tomatoes being placed in the receptacle through a suitably arranged hopper, the piston, being caused to descend by pressing a treadle, forces the contents out of the tube and into the can. When the latter is full, the cut-off plate is placed so that its opening no longer corresponds with the end of the tube, so that its solid portion prevents the escape of the tomatoes after the can is removed. A trough is placed in such a position as to receive any of the substance being canned that may escape from the tube, or may be spilled while filling the cans, and conduct it to a receptacle placed at the rear of the machine.

### Attaching Stereotype Plates to Blocks.

Marshall J. Hughes, New York city.—A stereotype plate is cast on and around a wooden block or blocks, and thus attached thereto so that, when an impression is taken, it can be "locked up" without the delay and preliminary labor required to attach the ordinary stereotype plates to blocks or backing. The invention is important to printers, especially to proprietors of country journals and others who use selected matter, also to advertisers in general.

### Improved Cotton Chopper and Cultivator.

Mansfield L. Nearn, Double Bridges, Tenn.—This invention is an improvement in the mode of attaching shovels to the standards of cultivators, more especially those employed in cotton culture. The invention consists in forming two parallel vertical slots in the shovels, through which bands or straps of sheet metal are passed, and in forming notches or recesses in the sides of the standards in which said bands or straps are laid and secured.

### Improved Car Coupling.

William R. Coovert, London, Pa.—This invention is an improvement in the class of car couplings formed mainly of arrow-headed links or draft bars, and pivoted latch blocks engaging therewith. The invention consists in connecting a draft bar to a pivoted block having a ratchet mechanism for elevating it, so that the pin which connects the two will be disengaged from the draft bar when the pivoted block is raised.

### Improved Farm Gate.

Jacob C. Rohrer, Gomer, Ohio.—The frame consists of two vertical side pieces, of which the stronger piece is placed sidewise of the main post of the gate, turning with its lower end in a recessed block which is set securely into the ground. The upper part of the piece is recessed and turns in arms, which are applied to the top of the main post. The two vertical pieces are laterally connected by a top piece, diagonal brace, and horizontal piece. The vertical pieces, and also the diagonal brace, are recessed sufficiently for the passage of the horizontal pieces. The upper piece of the gate is carried by rollers, so that the gate slides easily in the frame forward and backward. The vertical end pieces limit the extent of sliding the frame, being, however, so constructed that that part of the gate which extends beyond the stronger piece balances the fore part of the gate and frame, so that the whole gate swings readily and easily in bearings.

### Improved Composition for Removing Incrustation in Boilers.

Charles Burfitt, New Wimbledon, England.—The composition is made in three different forms—that is to say, in block, in liquid, and in paste. The block composition is compounded of oak galls, Australian bark, soda, glue, Irish moss, and filtered water; to be set by the application of 170° of heat. Into the vessel in which the above ingredients are mixed is put a small quantity of arsenic. The liquid composition is oak galls, Australian bark, soda, Irish moss, and filtered water, boiled together for three hours. The paste composition is oak galls, Irish moss, Australian bark, soda, and filtered water, boiled to 120°. Tannic acid from vegetable matter is finally added.

### Improved Shaving Mug.

Andrew J. Furr and Walter C. Knaus, Boonsborough, Mo.—This invention is an improved shaving cup, so constructed that the water may be warmed and kept warm by a small lamp connected with the cup itself. A suitable chimney, as well as receptacles for brush and soap, is provided.

### Improved Glove.

Thomas G. Foster, Gloversville, N. Y.—This invention relates to gloves made of buckskin or other material; and it consists in the palm side and finger pieces cut in a single piece, with the finger and thumb pieces sufficiently long to turn over the ends of the finger and thumb, and be attached to the material on the back.

### Improved Overflow Alarm.

Thomas Mayes, Albany, N. Y.—The alarm mechanism may be of any suitable kind. There is a lever for holding it when it is not required to be sounded, and a catch for tripping said lever. A float is arranged in the drip pan to disengage said lever when the fluid rises in the pan nearly to the point of overflowing. It is proposed to use a tilting pan to raise the lever by receiving the drip from another pan upon it, the said tilting pan being weighted so that the drip falling on it at the other side of the fulcrum will raise the trip latch.

### Improved Composition for Purifying Illuminating Gas.

Samuel P. Parham, New York city.—Sawdust is mixed with lime, to which a solution of copperas in water is added, and the same, together with oxide of iron, thoroughly mixed and stirred, producing thereby a reddish brown composition. This composition is placed into large purifiers, which are alternately brought into use, so that the contents of one may be taken out, and, by exposure to the air, be revived and charged again, till gradually, by long and repeated use, the absorptive power is spent. The sulphureted hydrogen gases are distributed and absorbed in such a manner by the composition that no annoying smell is noticeable at all, and the gas issues from it purer than from the lime purifiers.

## Inventions Patented in England by Americans,

[Compiled from the Commissioners of Patents' Journal.]

From November 15 to November 27, 1873, inclusive.

BOLT MACHINE.—A. Wood, Worcester, Mass.
BRAKE.—G. Westinghouse, Jr., Pittsburgh, Pa.
CONCENTRATOR, ETC.—J. A. Peer *et al.*, San Francisco, Cal.
CONTROLLING DRAFT OF LOCOMOTIVE.—J. Richards *et al.*, Philadelphia, Pa.
ELECTRIC TELEGRAPH.—J. B. Stearns, Boston, Mass.
FURNACE, ETC.—J. F. Harley, Washington, D. C.
GAS ENGINE.—T. B. Fogarty, Warren, Mass.
HARDENING STEEL, ETC.—S. S. Lewis (of New York city), London, Eng.
IRONING MACHINE.—G. W. Cottingham, Refugio, Texas.
MAKING IRON, ETC.—H. M. Baker, Williamsburgh, N. Y.
MAKING SCREWS.—C. M. Spencer, Hartford, Conn.
ORGAN ACTION.—T. Winans, Baltimore, Md.
NAIL MACHINE.—National Horse Nail Company, Vergennes, Vt.
PIPE TONGS.—J. B. Brown, Middlesex county, Mass.
PRESERVING FIBERS.—T. Sim, New York city.
PRINTING MACHINE.—G. P. Gordon, Woodbridge, N. J.
RAILWAY AND CARS.—C. W. Hunt, West New Brighton, N. Y.
SHAPING BOOT SOLES.—J. B. Johnson, Lynn, Mass.
WATERPROOF BOOTS, ETC.—F. M. Shepard, New York city.

## Business and Personal.

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Machine Manufacturers acquainted with Clothes Pin Machinery, address Julius Smith, Rock Falls, Ills.

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Steam Fire Engines, R.J. Gould, Newark, N.J.

Peck's Patent Drop Press. For circulars, address Milo, Peck & Co., New Haven, Conn.

## ANSWERS TO CORRESPONDENTS

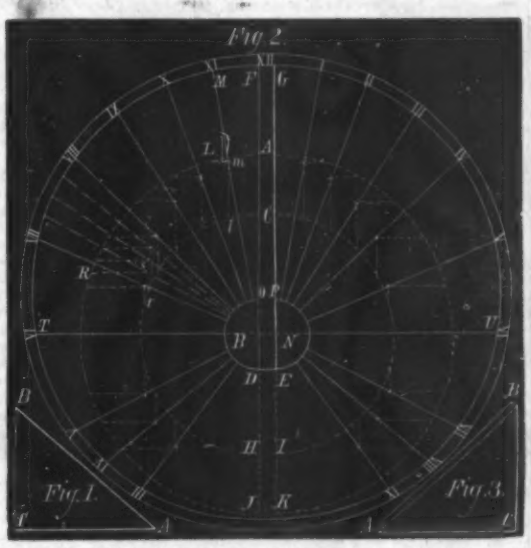
**W. H. H.** will find a recipe for blackboard composition on p. 299, vol. 28.—M. W. S. will find a description of phosphor bronze on p. 327, vol. 29.—A. G. can soften lead by melting a little tallow with it.—P. A. B. will find the proportions of an astronomical telescope on p. 279, vol. 27.—J. W.'s explanation of the creeping rail difficulty seems to be a correct one.—C. P. H. should refer to our prospectus on p. 410 of this issue, under "Copies of Patents."

**S. W. G. asks:** 1. In order to turn the face of a circle arm pulley smooth, which side should run towards the tool, the rounding or hollowing side of arm? 2. Which is the proper side to run a circle arm pulley on a shaft, to make it stand the most work? A. 1. The rounding side. 2. In the other direction.

**B. C. says:** I wish to experiment in making a glass composition, and I do not know in what way to construct a furnace to hold three or five barrels of material. I want a draft that will cause sufficient white heat, and that will allow access to the material in the crucible. If possible, I should wish to draw off the melted composition by means of a sluice gate. 2. What material should I use for the pot or crucible? A. In the manufacture of glass, fire clay crucibles are used, placed in a reverberatory furnace. The glass is generally removed by the workmen in small quantities at a time, adhering to iron rods which are thrust into the crucibles.

**J. B. asks:** Of what kind of wood should a vat to hold silver solution be made? What should it be covered with inside, asphaltum or paraffin? 2. What kind of a vat is required for nickel solution? I have tried to dissolve nickel with strong oil of vitriol and water. One pint of vitriol with water has only dissolved 1 ounce nickel in 14 days, and that lies at the bottom in powder and not in crystals. A. 1. The trough is generally made of pine, and coated with asphaltum, applied so hot that it will run freely. 2. You will find instructions in regard to nickel plating, on page 268, current volume.

**H. C. D. says:** Observation has led me to believe that the earth in its yearly motion does not go around the sun. I notice that the earth's termina points of motion are about December 21 and June 21. The books on astronomy teach that "if the earth is in any point of its orbit, the sun will always seem in the opposite point in the heavens. When the earth moves one degree to the west, the sun seems to move the same distance to the east." Now the sun's apparent termina points of motion are southeast and northeast, and the real terminal points of the earth's motion are southwest and northwest. What is your opinion? A. The earth's orbital motion could not be arrested or its direction changed without vaporizing it by the conversion of motion into heat. Observations similar to your own were doubtless made by the Druids, who erected Stonehenge, a circular assemblage of stones, representing the year. When it was perfect, the sun probably rose from the top of certain altar stones at the solstices and the equinoxes, to a person in a certain position.




**L. asks:** What is the size of the largest gun yet made in the United States? A. The largest gun made in this country has a bore of 20 inches, and its solid shot weighs about 1060 lbs.

**A. B. C. asks:** 1. Can a main belt work on the balance wheel of an engine? 2. What kind of belt is best? A. 1. Yes. 2. Any kind of a belt, flat, round, or angular, will answer, if the balance wheel is constructed with reference thereto.

**J. N. Q. asks:** What is soft iron, used in the construction of an electromagnet? If I want to make an electromagnet out of a bar of soft iron one foot long, does it matter whether it is round, or square, or what shape it is? Does it make any difference how large the bar is, whether the size of No. 16 wire, or an inch in diameter, or any other size? A. We believe Russian iron is the best for this purpose. The bar may be round or square. The size of the bar has a strong influence on the power of the magnet. The magnetism of cylinders of iron of equal length, magnetized by currents of the same force, and having the same number of windings surrounding the core closely, is proportionate to the square roots of the diameters of the cylinder.

**E. A. N. asks:** How can I soften chilled castings of iron? A. We know of no better plan than to place the castings, surrounded by saw dust, in an iron box, close it up with clay to exclude the air, and subject it to a red heat for several hours. The castings must be cold before they are withdrawn.

**C. H. M. asks:** 1. Where was the Great Eastern built? 2. What is metaline? A. 1. The Great Eastern was built at the works of John Scott Russell & Co., Millwall, London. 2. We believe the composition of metaline is kept secret by the manufacturers. It is a pressed compound of which plumbago is the base.

**E. E. P. says:** I run a boiler which carries 85 lbs. steam; I have been using water heated to 128° Fah. What would be the saving in fuel should I use water heated to 210° or 213° Fah.? A. In case all the other conditions were the same, the saving would be as follows: With water heated to 200°— about 7 per cent, to 212°— about 8 per cent.

**W. R. says:** 1. I have a pistol which I load with powder and ball. I notice that, after firing, the barrel looks as though it had been painted inside with red paint. After a short time, the red color disappears. The powder is the same as I use in a gun without any such appearance. Where does the red come from? 2. How can I remove the bark from a stick to use for a cane without injuring the wood? 3. Would it be likely to crack in seasoning? A. 1. It may be that the red oxide, which is readily decomposed by heat, is formed. 2. The bark can be removed when the stick is green, or afterwards, by steaming or heating it. 3. It should be seasoned slowly to avoid liability to crack.

**W. F. H. asks:** How can I get the numbers of concave spectacles in the most practical manner? I can get the convex ones correctly by measuring. A. We believe that double concave glasses are numbered in accordance with their radii of curvature. For instance, No. 6 glasses have a radius of curvature of 6 inches.

**A. P. asks:** Can you tell me how to draw the lines of a horizontal sun dial? A. Draw a triangle A B C, Fig. 1, having the angle, B A C, equal to the latitude of the place in which the dial is to be used. This angle may be laid off by the aid of a protractor, by a table of chords, or by the calculation of the sine and cosine. In our example, we have the angle, B A C, Fig. 1, 40° 42′ 45″, which is the latitude of New York city. From a table of sines and cosines, we find that sine of 40° 42′ 45″ = 0·653497. Cosine of 40° 42′ 45″ = 0·757191. Hence, in Fig. 1, make B C = 0·653497, and A C = 0·757191, on any convenient scale, and join the points A and B by a straight line. B A C will then be the required angle. Next, to construct the hour lines on the dial, draw two parallel lines J F, K G, Fig. 2, at a distance apart equal to the thickness of the style, Fig. 3. Draw a line, T U, perpendicular to these parallels, and mark the points of intersection, B and N. This will be the six o'clock line. From B as a center, draw two semicircles, with radii equal to A B and B C, Fig. 1. Divide each of these semicircles into twelve equal parts. Then from each point of division in the outer semicircle, draw a line parallel to T U, and from each point of the inner semicircle draw a line parallel to J F. The intersections of lines drawn from corresponding points of outer and inner semicircles give points of the hour lines. The hour lines can then be drawn through these points and the center B. To illustrate the construction, from the point L, of the outer semicircle, draw L m, parallel to T W. From *l*, the corresponding point of the inner semicircle, draw *l m*, parallel to J F. Then *m*, the point of intersection of the two lines, is a point of the eleven o'clock hour line, and this line may be drawn through B and *m*. To find the quarter hour lines, divide the outer and inner semicircles into four equal parts, between consecutive hour lines. Then draw construction lines, as before from points on the two semicircles, and their intersections will give points of the quarter hour lines, which are to be drawn through the center, B. The construction of these quarter hour lines is shown between the hour lines of VII and VIII. In this way, all the morning hour lines can be constructed. The afternoon hour lines are found in a similar manner, except that they radiate from the center, N, and the semicircles, used in construction, are drawn from the same point as a center. It is not necessary to lay off all the hour lines, but only enough to contain all the hours of the day between earliest sunrise and latest sunset, in the latitude for which the dial is constructed. The style, Fig. 3, should be made so as to have the angle B A C, equal to the latitude of the place. The base of the style should cover the space B N F G. The dial should be carefully levelled and placed so that B N points to the south, and F G to the north. To lay off a north and south line, draw several circles on a board, and place a light rod at the center, perpendicular to the plane of the board. Place the board in a level position, so that a shadow will be cast by the sun from the board. During the morning, mark the points where the shadow just reaches each of the circles, and mark the same points in the afternoon. Then bisect each of the arcs between the points marked in morning and afternoon, and the average direction of a line joining the centers of the circles and the points of bisection will be north and south. This construction, while not strictly accurate, is sufficiently correct, if carefully made. The time given by the dial must be corrected by the equation of time, which may be found in nearly any almanac. It will be observed that the hour lines around noon are closer together than those further removed on either side. For this reason, it is usual to place the center of the dial at a little distance from the center of the hour lines, so as to give greater divergence of the hour lines around noon.

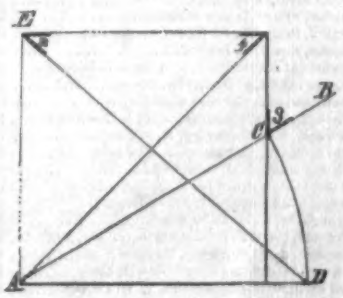
**L. P. asks:** 1. Is the link a cut-off, or does it wire-draw the steam by shortening the stroke of the valve? It closes the valve sooner or later just equal to what the lead varies, but does it do any more? 2. I am running a propeller 37x30 inches stroke, pressure 40 lbs., vacuum 15 inches, making 50 revolutions, cutting off at about one half stroke. The boilers have 2,500 feet heating surface, the surface condenser, about 600 feet cooling surface. The valve takes steam in the center and exhausts on the outside. It has 1¼ inches lap on the steam side, one thirty-second inch lap on exhaust side. The valve is set where the engine does its work, with seven sixteenths inch lead, mid-stroke lead one half inch, exhaust lead two and five thirty-seconds inches. The eccentrics are cast solid, and are therefore unalterable. The link is what, I presume, is called an open one, the eccentric rods being outside of the block, connecting to the valve directly, without any rock shaft. The eccentrics have 9 inches throw; but as I use it, only 5 inches throw. I get a better vacuum when well linked up, with the throttle wide open than any other way. Exhaust opens on the up stroke 7¼ inches from end of stroke, and five inches from end on the down stroke. I think this is wrong, and the remedy I propose is to bore out the eccentrics on one side and put in a bushing, or piece out the valve, or close up the ports. Piecing out would make the exhaust close sooner. By crossing the eccentric rods, I should get one half inch lap instead of seven sixteenths inch lead, taking steam just as the crank pin passes the center line, cutting off and exhausting later. What would be the effect on the engine's running smoothly, and would it take more sweep of the link to handle her? What would be the effect on the vacuum, and what would a diagram of each way look like? 3. What range of stroke and pressure has a good indicator? 4. The condenser has upright composition tubes 40 inches long x ¾ inch diameter, and weighing 16 ounces, taking water at the bottom and delivering on top, but to one side. The temperature of injection is 39°, and of discharge 160°, of hot well 140°. The circulating pump is 8 x 8 inches stroke, air pump 10 x 8 inches stroke, double acting, both making 120 revolutions. How can I increase the vacuum? How do you get the amount of water for a surface condenser? For a jet, Bourne gives about 20 times the amount contained in the steam. The tinning on the tubes seems to be eat away and small pin holes come. Is it the exhaust or the oil used? 5. How can I make the cut edge of belting (rubber) like the new edge? 6. How would hard wood, set in brass, do for foot and delivery valves, to work at a temperature of 140°? 7. What is the best method in the care of boilers with composition tubes? Is it not as well to feed a little salt water and blow off occasionally as to feed lime? What amount of lime is used per cubic foot of water evaporated? 8. What is the specific gravity of carbonic acid compared with fresh water? 9. Can a person prevent another from using a patent article, if he has used the same thing a number of years before the article was patented? A. 1. You have the right idea of the action of the link. 2. Probably you can secure a better action by adding lap to the exhaust side of the valve. Engines ordinarily require some cushion, whether high or low pressure. We scarcely think an alteration of the valve would affect much change in the vacuum. 3. Indicators are adapted to all strokes and steam pressures that occur in practice. 4. The trouble with your condenser seems to be that it is too small. The tubes are probably injured by some impurity in the oil. They are tinned by immersion in a tin bath. Theoretically, the amount of water required for a surface condenser can readily be calculated, and then it is customary to allow from one half to twice as much. For example, we will suppose that your engine cuts off at half stroke. Then in every revolution it uses a cylinder full of steam at 40 lbs. pressure. The capacity of the cylinder, adding 10 per cent for clearance, is about 20·5 cubic feet, so that in every revolution 20·5 × 0·13484 = 2·75 pounds of steam are used. Steam at this pressure has a total heat of 1201·8° Fah. The steam, when condensed, has a temperature of 160°, so that it has lost 1201·8° − 160° = 1041·8°, which it has imparted to the condensing water, raising the temperature of the latter 100° − 59° = 50°. Hence, in this case, if all the injection water is equally effective in condensing the steam, we shall require 1041·8 ÷ 50 = 20·83 times as much injection water as the amount contained in the steam, or 2·75 × 20·83 = 57·11 lbs. of injection water for each revolution of the engine. The circulating pump ought to be capable of delivering at least half as much more. 5. We do not think you can do it. Perhaps applying a hot iron to the edge might have a good effect. 6. The arrangement might answer. If the wood were placed endwise of the grain. 7. We know nothing of the action of lime, but do not think that, in ordinary cases, it will make any scale. Probably the best plan will be to make a slight scale in the boiler by the use of salt water. 8. About 0·00127. 9. We think you can use your arrangement, but cannot apply the improvements made by another party without first obtaining his consent.

**E. L. E. says:** I have a 12 inch cog wheel, gearing into a 3 inch. A crank is placed (1) on the 12 inch wheel, so as to give 5 inches leverage, or (2) so as to get 12 inches leverage, or (3) on center of 3 inch wheel. What proportions have these three powers? A. Disregarding friction, the resistance that could be overcome at the circumference of the small wheel, would be as follows: 1. 2½ times; 2, 5½ times, and 3, 4 times the power applied to the crank.

**J. H. asks:** 1. What would be the loss of steam by having a throttle valve 25 feet from engine, with a pipe of 1¼ inches inside diameter, well covered? The engine is of 10 horse power, working at 100 lbs. pressure to the square inch. 2. Were the guns on the first monitor set opposite each other, or were they set so as to fire in the same direction, having separate ports? 3. Are the guns arranged on all monitors as on the first one built? A. 1. Probably there would be no appreciable loss, under the circumstances mentioned. 2 and 3. The guns on all the monitors were arranged so that both pointed in the same direction.

**P. says:** I have a small printing press, which is run by a treadle. I want to know if it could be run by a weight, which could have a drop of forty or fifty feet. How heavy should such weight be? A. If it requires the power of a man to drive your press, then you will need a weight equal to one fifth of 33,000 lbs., or 6,600 lbs., raised 50 feet. This ought to drive your press 30 minutes nearly, if attached by rope and drum to your shaft.

**A. M. B. says,** in reply to E. R. G.'s question as to how to get the miter at the intersection of a raking with a level molding: Of course he is aware that the raking molding is of a different size and shape from the level. Draw a square of any size, and the line A B at the pitch of the cornice. Take A for a center, and C for a radius, and cut at D. Join E D, and in the angle 2




is the cut across the box; the angle 3 is for the side of box, the angle 4 is of course the miter for the level molding.

**MINERALS, ETC.**—Specimens have been received from the following correspondents, and examined with the results stated:

J. W. T.—Your specimen is iron pyrites, a combination of sulphur and iron. It is used for the manufacture of oil of vitriol, and also for copperas or sulphate of iron. For the latter purpose, the ore is piled in heaps and, after roasting, is kept moistened with water. By this treatment, and the action of the oxygen of the air, the sulphur becomes oxydized to sulphuric acid, which combines with the oxide of iron, also produced, forming copperas, which is leached out with water, concentrated, and crystallized. Your grindstone material might prove of value, if its transportation to market be not too expensive.

### COMMUNICATIONS RECEIVED.

The Editor of the SCIENTIFIC AMERICAN acknowledges, with much pleasure, the receipt of original papers and contributions upon the following subjects:

On a Square Acre. By J. H. M.
On Patent Cases in the Courts. By J.
On Cheap Telescopes. By S. M. B.
On Pisciculture. By J. A. M.
On Friction Pulleys. By B. N. C.
On Trisecting an Angle. By J. S. A.
On the Parabolic Mirror. By J. L.
On Reduction of Copper Ores. By F. C.
On Transfusion of Blood. By W. A. G.
On Rheumatism. By J. P.

Also enquiries from the following:

L. F.—M. F.

Correspondents who write to ask the address of certain manufacturers, or where specified articles are to be had, also those having goods for sale, or who want to find partners, should send with their communications an amount sufficient to cover the cost of publication under the head of "Business and Personal" which is specially devoted to such enquiries.

[OFFICIAL.]

## Index of Inventions

FOR WHICH

### Letters Patens of the United States

WERE GRANTED IN THE WEEK ENDING

### November 25, 1873,

AND EACH BEARING THAT DATE.

[Those marked (r) are reissued patents.]

| | |
|---|---|
| Acid, making sulphuric, J. Saunders | 144,928 |
| Alarm, automatic fire, C. H. Lehnis | 144,901 |
| Anchor, Z. Hall | 144,901 |
| Animals, stock for shoeing, J. Ditch | 144,963 |
| Axles, turning carriage, W. Jones | 144,918 |
| Baking mold, G. Wingate | 144,909 |
| Balances, weighing and price, A. M. Maynard | 144,914 |
| Barrel hoop, H. Ogborn | 144,920 |
| Barrel washer, A. Muntzenberger | 145,008 |
| Bed bottom, Crosby & Cameron | 144,939 |
| Bed bottom, E. Hoyt | 144,906 |
| Bed bottom, C. B. Spencer | 145,023 |
| Bed spring, W. W. Jones | 144,884 |
| Bee hive, W. S. Hough | 144,847 |
| Beer, preserving and forcing, E. C. Krausnick | 144,987 |
| Billiard cue clamp, O. D. Benjamin | 144,824 |
| Bird cage, E. Hutchinson | 144,907 |
| Blackboard, adjustable, P. W. Moeller | 144,917 |
| Boiler, farmer's, P. Colvin | 144,890 |
| Boilers, heater and feeder for, G. C. Williams | 144,987 |
| Boot, West & Lee (r) | 5,670 |
| Boots, making wood shanks for, W. N. Sprague | 145,024 |
| Boots, etc., crimping, M. R. Marcell | 144,905 |
| Bottle, glass, Borden & Trimble | 144,885 |
| Brush, paper hanger's, J. M. McComb | 144,999 |
| Butter tubs, etc., hasp for, H. C. Carter | 144,889 |
| Caisson, A. G. Wolfgram | 145,029 |
| Car axle box, D. Muxsey | 145,004 |
| Car axle journal, J. Whitaker | 145,035 |
| Car coupling, A. F. Chandler | 144,954 |
| Car coupling, J. T. L. Cochran | 144,956 |
| Car, dumping, Elliott *et al.* | 144,966 |
| Car ticket box, G. C. Thomas | 145,030 |
| Carburetor, J. Musgrave | 144,858 |
| Carding, etc., drawing wool after, J. & J. Dobson | 144,840 |
| Caster, sewing machine, J. K. Proctor | 145,011 |
| Chair rocker, Wilcox & Depledge | 145,036 |
| Cloth, finishing nap of, J. Dobson | 144,839 |
| Clothes dryer, Burch & Webb | 144,961 |
| Clothes tongs, E. A. Foulke | 144,972 |
| Coffee pot, Weber & Knutson | 144,966 |
| Cog-tenoning machine, S. W. Long | 144,982 |
| Collar and cuff dryer, D. W. De Forest | 144,838 |
| Corn coverer, J. A. Moore | 144,916 |
| Corset, woven, J. Ottenheimer | 144,921 |
| Cultivator, L. Haverstick | 144,846 |
| Cultivator, B. W. Wingo | 145,005 |
| Cultivator, hand, A. W. Ross | 144,927 |
| Curry comb, J. W. Trussell | 145,033 |
| Curtain fixture, J. F. Wollensak | 145,040 |
| Digger, potato, A. Willmann | 145,037 |
| Drain tile, J. Lemer | 144,990 |
| Dyeing, mordant for, Burgess & La Rhett | 144,952 |
| Dynamometer, G. W. Bigelow | 144,945 |
| Earth-boring machine, S. R. Owen | 145,007 |
| Engine, rotary, Baker & McIntire | 144,832 |
| Engine, rotary, L. H. Woods | 144,941 |
| Engine, steam, A. Beckman | 144,833 |
| Engine parallel motion, etc., A. J. L. Loreta | 144,832 |
| Engine valves, actuating, F. Chase | 144,881 |
| Fertilizer, manufacture of, H. Stevens | 144,977 |
| Fire arm, breech-loading, Scott & Matthews | 144,870 |
| Fire arm, breech-loading, H. N. Sherman | 144,872 |
| Fire indicator and alarm, J. Fawcett | 144,895 |
| Fishing stake, J. O. Campbell | 144,888 |
| Flour, manufacture of, T. Carr | 144,830 |
| Forge, blacksmith's, W. T. Kellogg | 144,986 |
| Fumigator, A. E. Denlinger | 144,962 |
| Furnace, blast, F. Buttgenbach | 144,829 |
| Furnace, desulphurizing, Hegeler *et al.* | 144,904 |
| Garden-cultivating implement, D. Mack | 144,912 |
| Gas carbureting apparatus, A. W. Porter | 144,868 |
| Gas manufacture, H. Skoines | 145,031 |
| Gas meter, paper dry, Schlissler & Dieterich | 144,868 |
| Gas pipes, clearing, Goldsmith *et al.* | 144,843 |
| Gas retort mouth piece, P. Munzinger | 144,857 |
| Gate, farm, W. Lucas | 144,994 |
| Governors, safety appliance for, J. Gaskell | 144,973 |
| Grain scourer, C. B. Horton | 144,980 |
| Grain separator, S. Day | 144,886 |
| Grape and flower picker, C. W. H. Delano | 144,837 |
| Grass, cutting flower maker's, T. & J. Millot | 144,916 |
| Grindstone wetting device, D. Cumming, Jr | 144,891 |
| Hammer, tack, G. J. Capewell | 144,953 |
| Hammers, machine for forging, W. Evans | 144,969 |
| Harness pad, S. A. Barker | 144,853 |
| Harness safety strap, C. W. Nichols | 145,006 |
| Harrow, L. C. Bamberger | 145,016 |
| Harrow, circular, G. W. Hills | 144,978 |
| Hat conformator, J. J. McKnight | 144,858 |
| Hat stiffeners, making, J. Samuels | 145,017 |
| Hinge, blind, L. Gathmann | 144,998 |
| Hinge, shutter, W. Foskett | 144,971 |
| Hog ringing pincers, J. C. Schoettle | 144,987 |
| Horseshoe, B. F. Cooke | 144,893 |
| Horseshoe nails, finishing, S. S. Putnam | 144,922 |
| Hose coupling, T. J. Mayall | 144,997 |
| Hose coupling spanner, L. Pond | 144,863 |
| Hose pipes, stop nozzle for, J. N. Allen | 144,942 |
| Indicator, pneumatic, Kealy & Rigney | 144,909 |
| Ingots for alloy, copper, J. Felix | 144,896 |
| Inkstand, B. Brower | 144,825 |
| Inkstand, T. S. Shenston | 144,929 |
| Iron finery fire, Ash & Walker | 144,831 |
| Ironing machine, J. F. Walker | 145,034 |
| Jack, lifting, Hamilton & Conner | 144,977 |
| Knit fabric, B. J. McGee | 144,915 |
| Ladder, fireman's, M. Cronin | 144,968 |
| Last block fastener, N. R. Streeter | 145,028 |
| Laster, shank, W. H. Hanna | 144,908 |
| Latch, door, F. Stowe | 144,981 |
| Latch, gate, J. Bull (r) | 5,668 |
| Leather splitting machine, Goebel & Preis | 144,899 |
| Letter box, B. B. Gurley | 144,976 |
| Locomotive smoke stack, J. V. Bishop | 144,884 |
| Lubricating compound, N. D. Smith | 144,875 |
| Malt polishing apparatus, W. W. Stoll | 145,027 |
| Measurer, spooling machine, Keith & Seaver | 144,965 |
| Medical compound, G. F. Munro | 145,002 |
| Milk cooler, Crane & Hadley | 144,835 |
| Mill, fulling, R. Eickemeyer | 144,841 |
| Millstone dressing machine, diamond, D. Laver | 144,851 |
| Mop wringer, A. W. Bunnell | 144,838 |
| Nail machine, cut, W. Haddock | 144,845 |
| Needle threader, F. R. Gaspary | 144,974 |
| Nut lock, W. H. Bowman | 144,886 |
| Nut lock, C. Dittman | 144,964 |
| Nut lock, C. A. Howard | 144,905 |
| Oil cabinet, T. Miller | 144,856 |
| Oven for plate glass, flattening, J. B. Boulicault | 144,946 |
| Pail, folding, Du Chateau & Williams | 144,893 |
| Paint, manufacture of, F. W. Gerdes (r) | 5,669 |
| Paper machines, stuff regulator for, D. Hamel | 144,902 |
| Photographic plate holder, A. Semmendinger | 145,020 |
| Piano string bridge, W. C. Ellis | 144,842 |
| Pipe coupling, D. Ashworth | 144,943 |
| Plane, metallic, J. F. Baldwin | 144,823 |
| Planing machine, J. Rankin | 145,012 |
| Planter, corn, J. G. La Fonte | 144,989 |
| Planter, hand corn, M. P. Nemmers | 144,919 |
| Plow, A. K. Dahl | 144,960 |
| Plow, steam, Allen, Browen & Moulthrop | 144,820 |
| Plug, testing, J. Allin | 144,881 |
| Power, spring, T. Ebeling | 144,894 |
| Press, hand power baling, P. C. Ingersoll | 144,983 |
| Printing press, feeding, J. T. Ashley | 144,822 |
| Printing enameled surfaces, S. J. Hoggson | 144,979 |
| Propellers, operating screw, A. McDonald | 145,000 |
| Pump, J. W. Douglass | 144,965 |
| Pump valve, Gould & Campfield | 144,844 |
| Purifier, middlings, E. N. Lacroix | 144,988 |
| Quicksilver, purifying, Randol & Wright | 144,993 |
| Radiator, steam, A. L. Ide | 144,981 |
| Railway frog, J. Wood | 145,041 |
| Railway rail fastening, A. M. Rouse | 145,015 |
| Railway switch, T. J. Reynolds | 145,013 |
| Railway switch, W. A. Slingerland | 144,930 |
| Railway switches, operating, J. Wood | 144,880 |
| Railway switch, self-closing, Hubbell & Gregory | 144,848 |
| Rake, horse hay, G. Sweet | 145,029 |
| Refining and desilvering lead, G. Luce | 144,998 |
| Register for machinery, S. F. Payne | 144,861 |
| Rubber, etc., compounds of, T. J. Mayall | 144,996 |
| Saddle, T. H. McGrath | 145,001 |
| Safe doors, operating, H. B. Tripp | 145,032 |
| Sample case, revolving, J. F. Randolph | 144,924 |
| Sap spout, H. B. Sevey | 144,871 |
| Saw mill dog, E. H. Stearns | 145,026 |
| Saw mill dog, J. Torrent | 145,031 |
| Saw mill head block, Prescott *et al.* | 144,866 |
| Saw set, W. J. Boynton | 144,947 |
| Scraper, road, R. F. Read | 144,925 |
| Scraper, road, Warner & Kingsley | 144,975 |
| Seeder, broadcast, J. R. Scarborough | 145,018 |
| Seeding machine, M. Schnapp | 145,019 |
| Seeding machine, E. Witzigman | 144,879 |
| Sewer bottom, cement, M. Day | 144,961 |
| Sewing machine, D. Porter | 144,864 |
| Sewing machine, O. St. Amant | 145,025 |
| Sewing machine caster, J. K. Proctor | 145,011 |
| Sewing machine extension table, J. Bennor, (r) | 5,667 |
| Shovel, sifting, C. Kaestner | 144,850 |
| Signal, fog, G. C. Pattison | 145,008 |
| Signal, railway, E. R. Marshall | 144,854 |
| Skirt, skeleton, P. Lippmann | 144,911 |
| Sleigh brake, T. H. Bromley | 144,949 |
| Smoke consuming apparatus, W. B. W. Smith | 145,022 |
| Soda water tumbler holder, J. Matthews | 144,913 |
| Spark arrester, G. Swenson | 144,932 |
| Spinning machine spindle, W. G. Perry | 145,009 |
| Spoke setting machine, W. R. Greene | 144,900 |
| Spring, door, F. H. Richards | 144,926 |
| Steel, manufacture of, C. M. Nes | 145,005 |
| Stoner, cherry, Buck & Kirk | 144,987 |
| Stove pipe stretcher, etc., G. Elsey | 144,967 |
| Strap coupling, T. Cogswell | 144,957 |
| Stubble shaver and scraper, Von Phul, Jr. *et al.* | 144,933 |
| Sulky, L. H. Jennison | 144,985 |
| Suspenders, T. J. Flagg | 144,970 |
| Table, ironing, L. Scofield | 144,869 |
| Tablet, writing, C. N. Brown | 144,950 |
| Tan drying apparatus, N. Porter | 145,010 |
| Thrashing machine, J. Smith | 144,874 |
| Toy, automatic, A. H. Dean | 144,959 |
| Trap, fly, Packard & Standish | 144,860 |
| Truss, brace, H. H. Roedel | 145,014 |
| Umbrella, H. L. Power | 144,865 |
| Umbrella, C. B. Spencer | 144,876 |
| Valises, etc., connecting frames of, C. Votti | 144,978 |
| Valve, A. Marriott | 144,996 |
| Varnish, refining, F. Kersting | 144,910 |
| Varnish for wood, metal, etc., J. F. Chevalier | 144,935 |
| Veneer cutting machine, W. H. Williams | 144,938 |
| Vessels' booms, antifriction, H. Gregory, Jr | 144,975 |
| Vessels, center board for, J. Espalla | 144,966 |
| Vise, adjustable bench, J. B. Wardwell | 144,994 |
| Wagon brake, E. N. Jack | 144,849 |
| Watch, stem winding and setting, E. J. Pacaud | 144,859 |
| Watches, reversible center pinion for, O. Gates | 144,897 |
| Water tank for hotels, J. H. Corey | 144,834 |
| Water wheel, B. J. Barber | 144,944 |
| Whiffletree, D. S. Sloan | 144,873 |
| Wire-drawing machine, J. & E. Woods | 144,940 |
| Wood, compound for filling, C. E. Bradley | 144,948 |
| Wrench, T. L. Buckley | 144,826 |
| Wrench bars, die for forging, L. Coes | 144,892 |
| Wrench, hose, E. Bucklin, Jr | 144,827 |

### APPLICATIONS FOR EXTENSIONS.

Applications have been duly filed and are now pending for the extension of the following Letters Patent. Hearings upon the respective applications are appointed for the days hereinafter mentioned:

27,297.—RAILROAD CAR COUCH.—E. C. Knight. Feb. 11.
27,305.—FASTENING SAW HANDLES.—J. Neimeyer. Feb. 11.

### EXTENSIONS GRANTED.

26,243.—WATER CLOSET BASIN.—W. Boch, Sr.
26,262.—JOURNAL BOX.—W. M. Ferry, Jr.
26,276.—INDIA RUBBER HOSE.—T. J. Mayall.
26,321.—METAL CASTING MOLD.—J. P. Broadmeadow.
26,327.—NURSING BOTTLE.—F. J. La Ferme.
26,329.—BOOT TIP.—N. Silverthorn.

### DESIGNS PATENTED.

7,002.—KNIFE HANDLE.—J. D. Frary, New Britain, Conn.
7,003.—INKSTAND.—G. W. McGill, New York city.
7,004.—ORNAMENTAL MAT.—L. Moeslein, New York city.

### TRADE MARKS REGISTERED.

1,537.—EMERY.—Abbott & Howard, Boston, Mass.
1,538.—GUANO.—Guanahani Guano Co., Petersburg, Va.
1,539.—PLOWS.—Hunter & Co., Fredericksburg, Va.
1,540.—PERFUMERY, ETC.—Felix Prot & Co., Paris, France.
1,541.—CIGARS.—T. B. Slingerland, Rome, N. Y.
1,542.—CIGARS, ETC.—Consolidated Tobacco Co., Gilroy, Cal.
1,543.—TEAS, ETC.—Great Eastern Tea Co., Terre Haute, Ind.
1,544.—ORGANS.—G. Woods & Co., Cambridgeport, Mass.

### SCHEDULE OF PATENT FEES.

| | |
|---|---|
| On each Caveat | $10 |
| On each Trade Mark | $25 |
| On filing each application for a Patent (17 years) | $15 |
| On issuing each original Patent | $20 |
| On appeal to Examiners-in-Chief | $10 |
| On appeal to Commissioner of Patents | $20 |
| On application for Reissue | $30 |
| On application for Extension of Patent | $50 |
| On granting the Extension | $50 |
| On filing a Disclaimer | $10 |
| On an application for Design (3½ years) | $10 |
| On application for Design (7 years) | $15 |
| On application for Design (14 years) | $30 |

[Specially reported for the Scientific American.]

### CANADIAN PATENTS.

LIST OF PATENTS GRANTED IN CANADA FROM NOVEMBER 25 TO DECEMBER 5, 1873.

2,884.—T. W. Perry, Ringwood village, York county, Ontario. Composition of matter for a table sauce, called "Perry's Indian Chutney Sauce." Nov. 25, 1873.

2,885.—I. K. Proctor, Salem, Essex county, Mass., U. S., assignee of J. K. Proctor, Malden, Middlesex county, Mass., U. S. Improvement for sewing machine tables or stands, etc., called "Proctor's Caster Attachment for Sewing Machine Table, etc." Nov. 25, 1873.

2,886.—D. Saul, New Edinburgh, Carleton county, Ontario. Improvement in hoisting machine, called "Saul's Improved Hoisting Machine." Nov. 25, 1873.

2,887.—W. M. Rice and A. D. Cable, Montreal, P. Q. Improvement in laying the permanent way of railways, called "Rice's Cushioned Rail." Nov. 25, 1873.

2,888.—T. Paxton, Wm. Tate and C. Paxton, Fort Perry, Ontario county, Ontario, assignees of Wm. Dunn, same place. Machine for attaching to or connecting with gang plows, called "Dunn's Improvement on Gang Plows." Nov. 25, 1873.

2,889.—J. C. Schoonmaker, Kansas City, Jackson county, Mo., U. S. Improvement on lightning rods, called "Schoonmaker's Insurance Lightning Rod." Nov. 28, 1873.

2,890.—W. W. Weaver, New Haven, Oswego county, N. Y., U. S. Improvement on turbine wheels, called "Weaver's Volute Chute Turbine." Nov. 28, 1873.

2,891.—J. G. Loggins and T. P. Wilkins, Williston, Chittenden county, Vt., U. S. Improvement on machine for cutting the notch in wooden hoops for barrels, etc., called "The Hoop Locker." Nov. 28, 1873.

2,892.—C. Campbell, Montreal, P. Q., and J. A. Laemle, Staten Island, U. S. Improvement on printer's furniture, called "Campbell's Improved Printer's Furniture." Nov. 28, 1873.

2,893.—Honorable H. Aylmer, Melbourne, District of St. Francis, P. Q. Improvement on machine for cutting clapboards, called "Aylmer's Clapboard Machine." Nov. 28, 1873.

2,894.—G. Boucher de Boucherville, P. Q. *Nouvelles maniere de se servir des lames pour propulser le nativres, "Lame Motenr."* Nov. 28, 1873. Improvement in "new paddles for propelling vessels."

2,895.—J. C. Livermore, Boston, U. S. Improvement on skirt protectors, called "The Oracoline or Dayton Skirt Protector." Nov. 28, 1873.

2,896.—H. Parker, Gananogue, Leeds county, Ontario. Improvement in the art or process of molding cores and mold employed for casting the cores by such improved process, called "Parker's Improved Process and Mold for Casting Cores." Nov. 28, 1873.

897.—J. P. Bass, Bangor, Penobscot, Me., U. S., assignee of H. C. Bucknam, Bricksport, Hancock county, Me., U. S. Improvement on the process or method of cleaning surface condensers, called "Bucknam's Process for Cleaning Surface Condensers." Nov. 28, 1873.

2,898.—F. H. Perry, Drummondville, Welland county, Ontario. Machine for washing textile fabrics, called "Perry's Hydraulic Washer." Nov. 28, 1873.

2,899.—Wm. C. Sillar, No. 1 St. Swithin's Lane, London, Eng., R. G. Sillar, Lee, Kent county, Eng., and C. Rawson, No. 1 St. Swithin's Lane, London, Eng. Improvement on deodorizing, purifying and utilizing sewage, night soil, excreta and excrementitious and refuse matters, called "The Native Guano Company's Improvement on Deodorizing, Purifying and Utilizing Sewage, Urine, Night Soil, Excreta and Excrementitious and Refuse Matters." Dec. 5, 1873.

2,900.—S. Standish, Eureka, Lauder county, Nevada, U. S. Improvement on Brooms, called "Standish's Broom." Dec. 5, 1873.

2,901.—C. Stoner, Montreal, P. Q., assignee of I. Fisher, Boston, Mass., U. S. Improvement on mechanism for lighting gas burners, called "Fisher's Automatic Gas Lighter." Dec. 5, 1873.

2,902.—E. Moneau, San Francisco, Cal., U. S. Improvement on sewing machine, chiefly designed for embroidering and stitching button holes, called "The Eureka Button Hole Sewing Machine." Dec. 5, 1873.

2,903.—T. Baty, Westminster township, Middlesex county, Ontario. Useful fence, called "Baty's Farm Fence." Dec. 5, 1873.

2,904.—I. Fréchette, St. Hyacinthe, P. Q. *Ameliorations aux rateaux de moissonneuse*, called "*Rateaux de Moissonneuses Ameliorees.*" Dec. 5, 1873. Improvement on rakes for mowing machines.

2,905.—D. Heaton, Providence, R. I., U. S. Improvement in combination tools, called "The Imp." Dec. 5, 1873.

2,906.—F. Rogers, Lynn, Essex county, Mass., U. S. Improvement on the manufacture of shoes, called "Rogers' Improved Shoe." Dec. 5, 1873.

2,907.—J. L. and D. H. Coles, New York city, U. S. Improvements on sewing machines, called "Cole's Universal Feed Sewing Machine." Dec. 5, 1873.

2,908.—J. Miller, Perth, Lanark county, Ontario. Improvement on sewing machines, called "The Miller Sewing Machine." Dec. 5, 1873.

2,909.—J. H. Copping, Toronto, Ontario. Improvement on a machine for the rolling, printing and cutting of lozenges, called "Copping's Improvements on Lozenge machine." Dec. 5, 1873.

2,910.—H. J. Davies, Brooklyn, Kings county, N. Y., U. S. Improvements on machines for printing and embossing skirts and other articles, called "Davies' Machine for Printing and Embossing Skirts." Dec. 5, 1873.

2,911.—H. F. Knapp, New York, U. S. Improvements o means for raising and floating wrecks and sunken vessels, called "Knapp's Improved Means for Raising and Floating Wrecks." Dec. 5, 1873.

2,912.—J. Varney, Montreal. Improvement on washing machine, called "Varney's Washing Machine." Dec. 5, 1873.

2,913.—D. S. McKinnon, Carleton Place, Lanark county Ont. Improvement in sewing machine stands and covers, called "Mack's Sewing Machine Stand." Dec. 5, 1873.

2,914.—P. D. Cummings, M. Smith and J. C. Jordan, all of Portland, Maine, U. S. Improvement in match slitting machine, called "Cummings, Smith and Jordan's Match Slitting Machine." Dec. 5, 1873.

2,915.—T. A. Heintzmann, Toronto, Ont. Improvement on pianofortes, called "Heintzmann's Improved Bridge." Dec. 5, 1873.

2,916.—W. M. Fuller, New York, U. S. Improvement on heating apparatus, called "Fuller's Improved Heating Apparatus." Dec. 5, 1873.

2,917.—M. Thibault, Hull, Ottawa county, P. Q., and S. Benoit, of Ottawa, Carleton county, Ont. Improvement on machine for cutting nails, called "Thibault's Improved Nail Cutter." Dec. 5, 1873.

2,918.—D. M. Lamb, Strathroy, Middlesex county, Ont. Improvement on filters for oil and other liquids, called "Lamb's Combined Oil Filter." Dec. 5, 1873.

2,919.—D. M. Lamb, Strathroy, Middlesex county, Ont. Manufacturing and treating vulcanizable gum and hydrocarbon oils, called "Lamb's Gum and Oil Process." Dec. 5, 1873.

2,920.—D. M. Lamb, Strathroy, Middlesex county, Ont. Compound vulcanizable gum, called "Lamb's Vulcanizable Waterproof Gum." Dec. 5, 1873.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# Patents and Caveats
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This is the closing inquiry in nearly every letter, describing some invention which comes to this office. A *positive* answer can only be had by presenting a complete application for a patent to the Commissioner of Patents. An application consists of a Model, Drawings, Petition, Oath, and full Specification. Various official rules and formalities must also be observed. The efforts of the inventor to do all this business himself are generally without success. After great perplexity and delay, he is usually glad to seek the aid of persons experienced in patent business, and have all the work done over again. The best plan is to solicit proper advice at the beginning. If the parties consulted are honorable men, the inventor may safely confide his ideas to them: they will advise whether the improvement is probably patentable, and will give him all the directions needful to protect his rights.

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This is an inquiry which one inventor naturally asks another, who has had some experience in obtaining patents. His answer generally is as follows, and correct:

Construct a neat model, not over a foot in any dimension—smaller if possible—and send by express, prepaid, addressed to MUNN & Co., 37 Park Row, together with a description of its operation and merits. On receipt thereof, they will examine the invention carefully, and advise you as to its patentability, free of charge. Or, if you have not time, or the means at hand, to construct a model, make as good a pen and ink sketch of the improvement as possible and send by mail. An answer as to the prospect of a patent will be received, usually, by return of mail. It is sometimes best to have a search made at the Patent Office; such a measure often saves the cost of an application for a patent.

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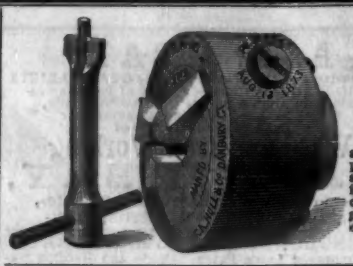

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# SCIENTIFIC AMERICAN

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Volume XXIX. [NEW SERIES.] NEW YORK, DECEMBER 3, 1873. [$3 per Annum, IN ADVANCE.


## ASCHENBRENNER'S IMPROVED SUGAR-MAKING PROCESS.

There is no process of chemical industry in which the waste reaches greater proportions than in that of sugar manufacture. Dr. Scoffern estimates the loss as nearer two thirds than one half, while another authority emphatically characterizes the proportion as enormous. The weight of the contents of a hogshead of sugar—according to an article on this subject recently published in *Iron*—is about 2,128 lbs. To obtain this quantity of sugar, 2,500 gallons of cane juice are often used, of a strength say of 9° Baumé. Each gallon at this average density contains 1·61 lbs. of sugar; hence 2,500 gallons contain 4,525 pounds. But the planter, as above noted, gets but 2,128 lbs.; hence the amount lost, or 2,397 lbs., *is* actually more than the maker has to sell. Of this loss 426 lbs. is molasses drained off, while the balance is waste of saccharine matter lost by caramelization; while ordinary processes have the still further defect of evolving, by the boiling of the cane juice, gases which impair the quality of the sugar.

With a view of overcoming these obstacles, the invention we herewith illustrate has been devised. According to the claims of its originator, the largest possible quantity of dry, pure, and naturally white sugar in marketable shape is produced. The importance of such an apparatus, if thoroughly efficient, cannot be overestimated, not only as influencing a vast industry, but as directly affecting every consumer of the staple; and hence no further introduction will be needed to bespeak for the following description the careful consideration which its subject deserves.

The course of the juice, as it emerges from the grinding mill, is through the trough, A, in which, at B, are arranged two inclined filters of different degrees of fineness, the liquid of course passing through the coarse one first. These filters are placed in two sets of grooves so that one pair can be removed for cleaning, leaving a second couple continuing to act, so that the operation need not be interrupted. The object of these appliances is to stop the passage of mechanical impurities floating in the juice. The conduit, B, discharges into a flannel, bucket-shaped receptacle, C which is also so arranged over a tank, D, as to be readily removed for cleaning and another quickly substituted, which serves to finish the initial filtering process

The liquid is next conducted to three open kettles in succession. Each kettle has a double bottom so as to be heated by steam. In these receptacles, the juice is precipitated by means of lime and magnesia, a process facilitated by the high temperature imparted by the steam, after which the sediment is drawn off by suitable tubes at the bottom. Thus purified, the liquid passes away through the siphons, E, to another filter, F, which removes the last vestige of foreign substance which may still remain held in suspension. This apparatus consists of a metal case, in which is placed a second case, having two perforated ends and two perforated partitions, forming three compartments. The first is filled with sponge, the second with bone black, and the third with charcoal. At each end is an empty space for the entering and emerging juice. The inner case is provided with handles to admit of its being lifted out of place for cleaning.

The pump, G, then lifts the juice into the sulphur box, H. This latter portion of the apparatus is of wood, encloses a paddle wheel which is actuated by the steam engine of the mill, and is fed with sulphurous fumes from the adjoining sulphur furnace, I. The revolving paddles throw the fluid into rapid agitation, so that it is thus more thoroughly exposed to the action of the gas and caused, it is claimed, to leave the box in a perfectly bleached condition. The emerging stream, which is of about two thirds of an inch in diameter, passes at once upon a long trough of sheet metal, J, which, heated interiorly and underneath by steam, supplied through the pipes shown, serves to raise the temperature of the liquid to a degree not exceeding 194° Fah., by a condensation of 32° or 33° Baumé. Beneath this trough at K, is arranged suitable apparatus for altering its degree of inclination at pleasure, thus hastening or retarding the flow.

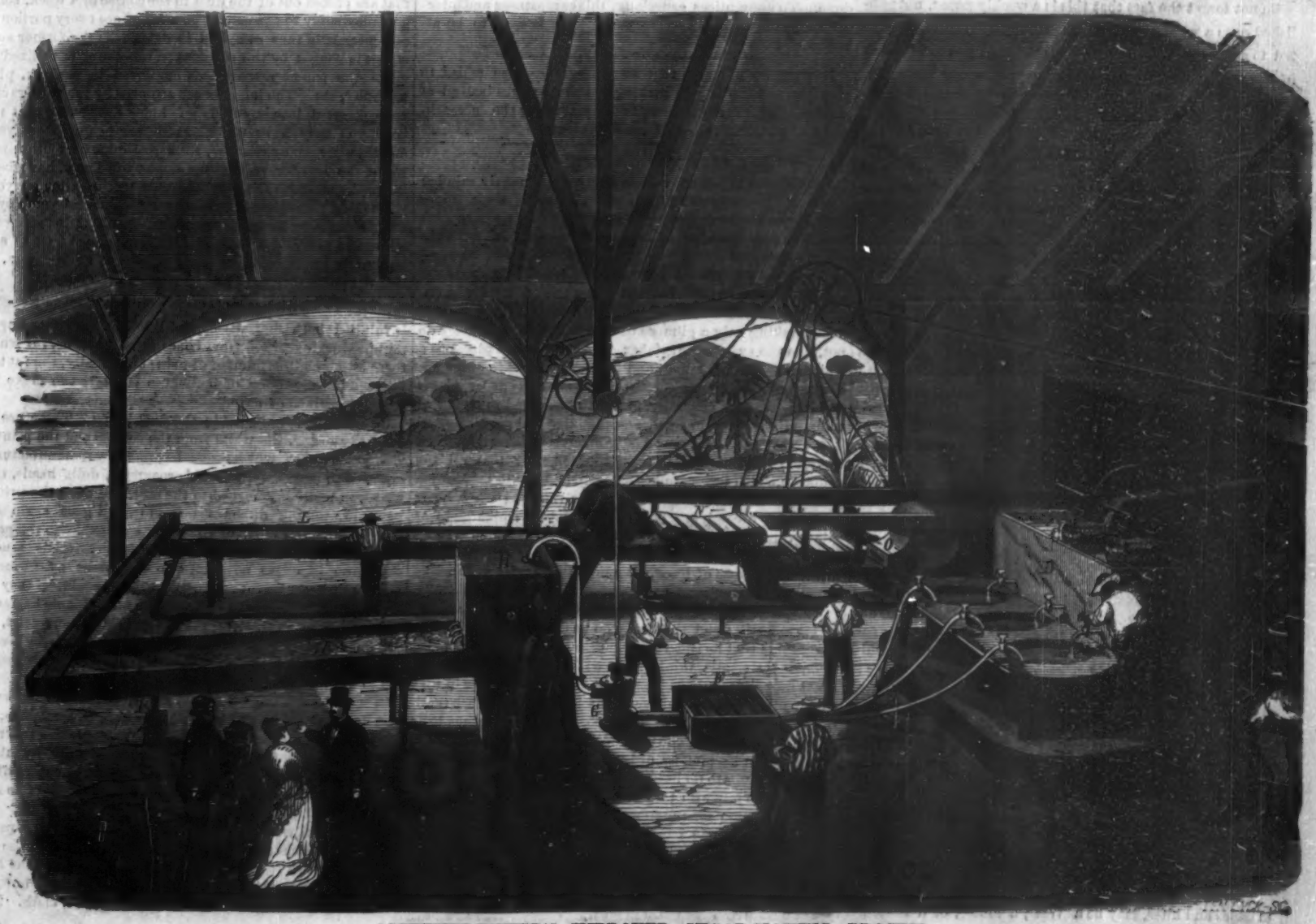
Passing next through a connecting canal, the juice, in a stream half an inch in diameter, exits upon a second trough or box, L. This conduit is arranged similarly to the trough, J, and the liquid is here heated up to from 212° to 220° Fah., and thereby condensed to 40° or 45° Baumé. When it reaches the lower end of the incline, occupying from 10 to 12 minutes in the transit, the stream has a thickness of one third of an inch. At this point, in order to carry off all the vapor, hasten condensation, and prevent the boiling of the juice, a steam fan, M, is introduced. By the effect of this appliance, together with that of the processes to which it has already been subjected, the liquid becomes so thick as to necessitate the use of a scraping apparatus, N, which consists of an endless band, passing over pulleys and provided with transverse blades, placed at suitable distances apart. This is set in motion by the engine and serves to convey the material to another inclined plane similar to those already described, where it is acted upon by a second fan, O. Finally the sugar, now in a crystalized condition, is removed by hand into the last receiver.

When it is desired to produce molasses, a small percentage may be obtained by making the incline of the troughs steeper, thus hastening the process and preventing the perfect drying of the sugar by the action of the two ventilators. The molasses thus made is said to be of the best quality and of the finest color. The entire period of time occupied by the juice in passing through the apparatus is stated to be in the neighborhood of forty-five minutes.

As regards economy, we are assured that the percentage of fuel saved is remarkably large—a fact which may be justly inferred from the advantageous and ingenious arrangement of heating surfaces, etc.

The patent for this invention, the credit of which is due to Dr. H. M. Aschenbrenner, is now pending, in the United States, through the Scientific American Patent Agency. For further information, address Mr. T. Masac, care R. Matthias & Co., Apartado 525, Havana, Cuba.

SAGACITY OF BIRDS.—Certain facts render it probable that birds, in some manner, become aware of cholera infection in the air. Recent European journals state that at Munich, where several cases of cholera have occurred, the rooks and crows, which flew about the steeples and through the trees of the public promenades, have all emigrated; and the same thing happened during the cholera seasons of 1836 and 1854. According to Sir Samuel W. Baker, the same phenomena occurred at Mauritius, where immense numbers of martins disappeared during the prevalence of cholera.



ASCHENBRENNER'S IMPROVED SUGAR-MAKING PROCESS.

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IN these times every man who has money to invest desires to place it where it will make the best return. This being admitted, we undertake to say that $3, invested in the SCIENTIFIC AMERICAN, will return threefold, in the amount of valuable information which its columns supply. Mechanics, inventors, manufacturers, farmers, as well as every head of a family, will get, on an average, $10 worth of information from a year's numbers.

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Do not forget the fact that this is a weekly paper, not published once a month merely, as are many publications devoted to specialties; but remember that for $3 you get a copy of the paper every week during the year.

## THE LEISURE TIME OF BOYS.

Every father of a family knows that there is a time in the life of his sons that gives him much trouble and some anxiety. We allude to the period of boyhood, when exuberance of spirits and thoughtlessness are at their hight, and when the studies imposed by school discipline are entirely insufficient to find adequate employment for their too active minds and bodies. And it is not possible, or even desirable, to increase the already considerable application of all well bred boys to the study of books and the acquirement of learning. It is not to be wished that a youth of twelve should grow up to be a conceited would be pedant of twenty, and a bookworm of thirty years of age. Thus the task of finding fitting occupation for the leisure hours of a boy is no inconsiderable one, as few pursuits into which a boy would plunge with eagerness are suited for putting in the way of so much impulsiveness and want of consideration as most boys possess. The question, then, of how to amuse our boys, is one of paramount importance and difficulty.

We would suggest, to the many parents who have been perplexed with this difficulty, to give their lads every possible opportunity of acquiring a mechanical trade. The industry and ingenuity of a boy of average ability may easily be made to furnish him with a never failing source of amusement of the best order. The boy who can produce or make something already begins to feel that he is somebody in the world, that achievement of a result is not a reward reserved for grown people only. And the education of mind, eye, and hand, which the use of tools and mechanical appliances furnishes, is of a great and real value, beyond the good resulting from the occupation of leisure time. Having nothing to do is as great a snare to the young as it is to the full grown; and no greater benefits can be conferred on youths than to teach them to convert time now wasted, and often worse than wasted, into pleasant means of recreation and mental improvement.

We say, therefore, to all parents: Provide your boys with mechanical apparatus and tools. There is no greater pleasure to most boys than the handling of a tool; and many great men and ingenious inventors look back with gratitude and delight to the day when they were first allowed to use the lathe, the saw, and the plane.

The boy, whose time and mind are now occupied with marbles and kites, may be a Watt, a Morse, or a Bessemer in *embryo*; and it is certainly an easy matter to turn his thoughts and musings into a channel which shall give full scope to their faculties. And to most boys the use of mechanical tools is the most fascinating of all occupations.

As logic and mathematics have a value beyond accuracy in argument and the correct solution of problems, in that they teach men the habit of using their reflecting powers systematically, so carpentry, turning, and other arts are of high importance. These occupations teach boys to think, to proceed from initial causes to results, and not only to understand the nature and duty of the mechanical powers, but to observe their effects; and to acquire knowledge by actual experiment, which is the best way of learning anything. All the theories culled out of books leave an impress on the mind and memory, which is slight compared to that of the practical experience of the true mechanic.

Our advice is, to all who have the great responsibility of the charge of boys: Give them a lathe, or a set of carpenter's or even blacksmith's tools. Give their minds a turn towards the solid and useful side of life. You will soon see the result in increased activity of their thinking capabilities, and the direction of their ideas towards practical results; and, still more obviously, in the avoidance of idle mischief and nonsense (to omit all reference to absolute wickedness and moral degradation), which are, to too great an extent, the pastime of the generation which is to succeed us.

DO NOT overlook the fact that a single weekly number of the SCIENTIFIC AMERICAN, costing six cents, contains as much matter as most of the monthly magazines which are sold for 35 cents.

## HOW TO SUCCEED—WHAT CONSTITUTES SUCCESS.

The young man who thinks he can carry his boyish pranks into the serious business of life is not a man, and defrauds himself and his employer. "After work, play." That should satisfy the most sanguine. "Business before pleasure" is the motto of the prudent man whose guide is experience, and it is sufficient for the novitiate in active life.

But it is despicable to see the young man just starting in life so wedded to his former enjoyments as to place them above present duties. Yet this is often the case. The young man, who, to steer his own bark, launches forth on the sea of life, too often looks back on the pleasures he leaves behind, and, forgetful of present duties, steers back to past enjoyments.

There is no royal road to success any more than to knowledge. He who would succeed must work; and after all there is more real enjoyment in work, which has a worthy object, than in play or pleasure, intended to kill time. We remarked a few days ago to a business man whose present means are amply sufficient, but who worked really harder than any of his numerous employés, that he ought to "take it easy." Said he: "I am never so happy as when I have more than I can do. I may wear out in working, but I dread to rust out in idling." He was right. His work was a part of himself, a part of his life, and it was always faithfully done. To apprentices especially, this earnestness and interest in their work is necessary if success is ever to be attained.

IT WILL be observed that four pages has been added to this issue of the paper, making it twenty pages instead of sixteen. This is to compensate the reader for the encroachment of a large number of advertisements.

## SYSTEMATIC THINKING.

People who think unsystematically are slovenly minded people. The facts and ideas stowed away in their upper chambers are all topsy-turvy. No sooner do they turn over something in the hope of finding another something than they cover up still another something, which, in its turn, will soon be wanted and rummaged after. Their heads are not well arranged libraries, but garrets filled with rubbish. If they commence to think upon any subject, they shift it about, taking only a glimpse of it here and there. They do not, like the systematic thinker, take a subject to pieces as a watchmaker does a watch, and lay the parts all in order under glass covers, but pitch them into all sorts of by places and corners, and generally, getting bewildered in trying to replace them, become hopelessly muddled and give it up.

A great deal is said now-a days about the power of modern thought; but it would be well to remember that all the thinking which bears fruit is systematic thinking. Many a young man imagines himself to be thinking when he is merely day dreaming. Thinking implies an active state of mind, calling up images, holding them fast, and arranging them in order; not a passive condition in which troops of ideas, or shadows of ideas, flit across the mental vision like figures in a kaleidoscope.

Thinking, worthy of the name, is work—systematic, calm, and connected; and the man who has not got his mind so disciplined that he can thus command it is not yet a thinker.

That systematic thinkers are so few is attributable in a great degree to early bad training. Not one teacher in fifty in our primary schools deems it of importance to teach children *how to study*, and a less proportion are competent to do this if they would. The most of them think their duties are comprised in keeping an orderly school, hearing recitations, assisting pupils to do hard sums, and allotting tasks. Especially in the latter do they excel. Memorizing is with most of them a name for mummery—a thing to be done by holding the head on one hand, swinging first one foot and then the other, and forcing the lips to repeat a formula until they will run of themselves long enough to get through a recitation by very force of momentum. And this laborious, meaningless task, they think, is study. In other words, study is to them the teaching of the lips to move from force of habit, while the mind may be wandering anywhere and everywhere.

Thus a vacant, wandering habit of mind is secured with the spelling lesson, and ground in with the rules of grammar; and unless, by rare good chance, the unfortunate overtasked and mentally disgusted young intellect meets in its onward progress some one who can show it the mistake, or has native genius to discover it without help, it grows into habitual slovenly mindedness.

After all, teachers are no more to blame than parents who demand that progress shall be measured by pages of a book rather than by power to think.

REMEMBER that one year's numbers of the SCIENTIFIC AMERICAN, costing only $3, contains more than an equivalent of 4,000 ordinary pages of book matter.

## THE SAVINGS OF SCIENCE.

Doubtless many of our readers have perused Dickens' excellent novel "Our Mutual Friend," and hence are, in a measure, familiar with the London dust heaps. Perhaps it will be remembered how the great writer describes their contents, and, in his inimitable style, sketches the queer people who often spend their lives among them in seeking for treasures. Those patient searchers are creations of the past. Their toilsome occupation is gone; for Science, with her inventions and processes, has extended her sway even to the worthless dust heaps, and from the filthy waste brings out the shining gold. The ordinary waste of a single household may be roughly estimated at a barrelful per day, and London, it is said, contains five hundred thousand houses. Hence, the reader may form some idea of the wonderful ingenuity which contrives to utilize the enormous aggregate of one hundred and eighty million barrels of refuse in the course of a single year.

The local authorities of London sell the privilege of removing dust and garbage from each district to a contractor, who carts it away to a large yard in the suburbs. There hill women, sieve in hand, separate the mass, by a rude analysis, into component portions. The most valuable of the latter are the waste pieces of coal, and the *breese* or coal dust and half burnt ashes. The amount of waste of the latter may be measured by the fact, that, after selling the larger pieces to the poor, the refuse *breese* is sufficient to bake the bricks that are rebuilding London. The material is used by the contractors who generally combine the builder's trade with their regular calling, for the purpose of imbedding the newly made bricks into compact squares. The coal dust having been fired, the mass burns with slow combustion for two or three weeks, aided by the circulation of air which is kept up by the method of stacking. The other constituents of the dust heap are separated by the sifters with the utmost rapidity: bones, rags, paper, old iron, glass, and broken crockery, and even bread, as they are eliminated from the mass being piled in separate heaps. The bones are put to a score of different uses. Of the several tuns of bones that are picked out of the dust in the course of a week, some go immediately to the boiling houses, where every portion of fat and gelatin they can yield is extracted; the former substance is bought by the soapmaker, the latter is utilized to make the patent preparations employed in cookery, photography, etc The larger bones are used by the turners and are converted into hundreds of knick knacks, so that the bone you may have picked at dinner again enters your mouth, after many changes, as a toothpick or toothbrush, while the smaller pieces, for aught you know, have been calcined, and form the very charcoal toothpowder on your toilet table. Fragments that cannot otherwise be employed are ground very fine, and treated with sulphuric acid, constituting an excellent artificial fertilizer. Bone dust is also sometimes used by bakers for purposes of adulteration, so that the poetical remark of the giant in the fairy tale,

"I'll grind his bones to make my bread,"

is fulfilled both figuratively and literally. Another important product extracted from bones is phosphorus, for which there are an endless number of uses; and, finally, the fat that is saved in the process of boiling, is employed to make the commoner kinds of soap.

Scraps of paper abound in the dust heaps. These are all carefully sorted, the white from the colored and the printed. The soiled pieces, which cannot be profitably remanufactured, are used to make *papier maché* ornaments, dolls' heads, etc.; the clean paper is returned to the mill, and even the printed paper has the ink discharged from it, and goes again into circulation. Old rags, of course, are valuable to the paper maker, although the discovery of other materials renders this form of waste not quite so important as formerly. Greasy dish cloths cannot go to the mills again, so they are sent to the hop grower, to whom they are valuable as fertilizers. Woolen rags, if they happen to be dyed scarlet, are treated for the recovery of their cochineal, which is used as a dyeing material; and other valuable colored rags are ground up to make flock paper.

The great markets for all old woolen fabrics in England is the town of Batley and its neighborhood, in Yorkshire, the great shoddy metropolis. A writer says, regarding this manufacture: "Reduced to filaments and greasy pulp, by mighty toothed cylinders, the much vexed fabric re-enters life in the most brilliant forms, from the solid pilot cloth to silky mohairs and glossiest tweeds."

Cotton and woolen rags are both valuable when separate, but of late years it has been the custom to weave the cotton and woolen together, the warp being made of the latter material and the weft of the former; thus mixed, however, the fabric cannot be converted into paper or cloth. Many

endeavors have been made to effect a separation, and at present the rags are placed in a closed receiver and subjected to steam at a very high temperature. The result is that the cotton comes out pure and fit for the paper maker; the wool is reduced to a dark brown powder, known as the ulmate of ammonia, and is employed to enrich manures which are poor in nitrogen.

A very important constituent of the dust heap is the old iron, battered saucepans, old pails, rusty hoops, horseshoes, and nails from the road. All soldered articles have the solder extracted from them, as it is more valuable than the iron, and the cheaper metal is then melted. The horseshoe nails are not mixed with the common cast iron, as they are much sought after by gunmakers for the purpose of making stub twist barrels. Scraps of iron, it is found, may be made very useful in securing the copper in the streams washing veins of copper pyrites. Pieces of battered iron are placed in tanks, into which these are collected; the copper quickly incrusts the iron, and in process of time entirely dissolves it, so that a mass of copper takes the place of the iron. The residuum, in the shape of a colored deposit, is at times taken out, dried, and smelted.

The savings of science, however, are not all made in the dust heaps of London, though in the brief outline we have given, of the mode of utilising some of the constituents of the waste of the great city, a vast economy is indicated. A singular and recent French discovery is that sheep draw a considerable quantity of potash from the land on which they graze, much of which is ultimately excreted from the skin with the sweat. It was pointed out by Chevreul that this peculiar potash compound (*suint*) forms no less than one third of the weight of raw merino wool, while of ordinary wools it constitutes about 15 per cent of the weight of fresh fleece. As the *suint* may be extracted by mere immersion in cold water, it is easy for the manufacturers to produce more or less concentrated solutions from which the potash may be recovered by appropriate treatment. The development of this new industry is principally due to MM. Maumène and Rogelet, and their process consists in evaporating the solutions, which are sent to them, until a perfectly dry and somewhat charred residue has been obtained. This is placed in retorts and distilled very much in the same manner as coal at gas works, and the result is that, while much gas is evolved which can be used for illuminating the factory, and much ammonia is expelled which can be collected and utilized in many ways, there remains a residue which chiefly consists of carbonate, sulphate, and chloride of potassium. These three salts are separated by the usual method, and then pass into commerce. Curiously enough, they are remarkably free from soda.

The wool manufacturers of Rheims, Elbœuf, and Fourmies annually wash the fleece of 6,750,000 sheep, and the amount of potash, reckoned as carbonate, which these fleeces would yield if all were subjected to the new process, represents a value of $400,000. The by-products of gas works are so valuable now that factories are actually set up beside such establishments for their utilization. The most important is alum, which, like sal ammoniac, once came, at a great cost, from Egypt, but is now mainly procured from an aluminous shale, which forms the roofs of coal mines, and which has to be brought to the surface before the coal can be gained. This was for a long time a perfectly refuse material, covering acres of ground, like the scoriæ and cinder heaps; but chemistry has found it out, and now obtains the product by setting fire to the shale, the carbon and sulphur which it contains being sufficient for the purpose. The friable porous residua are afterwards heated in iron pans with sulphuric acid, to which is added the ammonia from the gas liquor, and the three bodies combine with water to make common or ammoniacal alum.

Nearly every article of the toilet bottle or the *sachet* is made from waste, sometimes from foully odorous matters. A peculiar fetid oil, termed fusel oil, is formed in making brandy and whisky. This fusel oil, distilled with sulphuric acid and acetate of potash, gives the oil of pears. The oil of apples is made from the same fusel oil by distillation with sulphuric acid and bichromate of potash. The oil of pineapples is obtained from the product of the action of putrid cheese on sugar, or by making a soap with butter and distilling it with alcohol and sulphuric acid. Oil of grapes and oil of cognac, used to impart the flavor of French cognac to common brandy, are little else than fusel oil. The artificial oil of bitter almonds is prepared by the action of nitric acid on the fetid oils of gas tar. The wintergreen oil of New Jersey is artificially made from willows and a body procured from a distillation of wood.

Dyes, like perfumes, are often derived from the most repulsive sources. The waste heaps of spent madder were formerly a great nuisance. It is now found that this hitherto waste can be used, and at least one third can be saved by treating it with hot acid. Prussian blue is made from pieces of horse hoofs or refuse woolen material by fusion with iron and alkali.

Perhaps the most important refuse product that can be mentioned, as proceeding from a systematic manufacturing process, is that known as soda waste. Large quantities of this substance are rejected as useless by most alkali works, and it has been, for many years, a problem and a reproach to chemistry. It is a great loss; and, if we can but recover it, no small victory will be achieved.

STEAM BOILER CEMENT.—Cooley recommends the following ingredients for mending cracks in boilers and ovens, and to secure steam joints: Litharge in fine powder, two parts; very fine sand, one part; slaked lime, one part. When wanted for use, it is made into paste with boiled linseed oil.

## ON THE PURCHASE OF PATENTS.

Complaints of fraud are sometimes made by purchasers of patent rights, who pay their dollars and receive their deeds, only to find out that the latter are defective and the money lost.

Example 1. A buys from B one half of all B's right in a certain patent, and takes it on the supposition that B owns the whole patent, but without instituting any examination to ascertain if such is really the fact. After the purchase, A employs an attorney to examine the records, and finds that B, at the time of the sale, was the owner of only one half of the patent; consequently A's title secures to him only one quarter of the patent, not one half as he supposed. A simple examination made *before* the purchase would have saved A from the loss.

Example 2. A contracts verbally with the patentee, B, for the exclusive right to make, use, and sell an invention during the lifetime of the patent, pays the money, receives the deed; and without examination of the document, supposing it to be right, places it on record and closes the transaction. Thereafter, on examination, it appears that the words, *the exclusive*, were omitted from the deed, the letter *a* being used in place. The deed, therefore, only conveyed *a right* to make, etc.; leaving to B the privilege of granting as many other rights as he might choose to the business competitors of A. Had A taken the precaution to employ an experienced attorney to examine the deed before paying the money, he might have really secured what he bargained for.

Example 3. A buys a patent, supposing it to be the only one ever granted for the special improvement claimed. It bears the genuine official marks of government origin, looks straight in all its forms, and appears to him to be all right. Without making a search, he pays the money, takes the deed, and proceeds at once to manufacture the article. After much labor and the outlay of several thousand dollars for mechanism, he succeeds in putting the goods on the market, when, to his astonishment, he is served with legal papers as an infringer of some prior patent; and only gets clear of the trouble by paying damages and buying an interest in the first patent. He is thus compelled to pay twice for the same article, which he might have avoided had he employed the services of proper persons to examine as to title and infringements prior to the first payment.

Example 4. A contracts for a patent, supposing that the device is a new thing. Surely, he thinks, the government of the United States would not issue a patent for an old device. He therefore concludes that it must be all right, pays the money, and receives a deed. Infringers make their appearance. He brings suit, and then, to his surprise, discovers that the invention is a very old one and the patent utterly worthless. The Patent Office is far from being reliable in its grants. The only safe way, where interests of value are at stake, is to have careful searches made by competent attorneys as to the validity of the patent.

The same remarks apply in respect to the scope of patent claims. The purchaser is too apt to suppose, in buying a patent, that the claim is broader than it is, and covers the manufacture of an article so as to exclude all competitors. He therefore goes extensively into the business, exhausting money and energy, only to find out, what an attorney's examination would have quickly revealed before hand, that the scope of the patent claim is very narrow, and the patent of little value.

In this matter of patent purchases, many persons are penny wise and pound-foolish. In other affairs, they are generally more discreet. If a man proposes to purchase the smallest piece of ground, he requires, in advance, that a search of the title shall be made before payment is concluded. The buying of a patent should be conducted in the same manner. All patents, their nature, claims, and scope, and all transfers of patents, are matters of public record; and the industrious attorney, if experienced in the business, can almost invariably ascertain beforehand whether the assignment is correct, the title good, the claim narrow or broad, and the device free or an infringement on some prior patent. No person should pay money, unless subject to careful searches on these points.

In the course of our (Munn & Co's.) long experience in patent matters, extending as it now does over a period of nearly thirty years, many cases of trouble and disappointment, occasioned by the carelessness of purchasers of patents, have been brought to our notice. We once received bitter complaints from the president of a large railway company against the patent system and inventors generally. His company had, he said, bought the patent for an improved ventilator, and, at much expense, fitted up their cars with the new device. But no sooner had they put the thing into operation than they were pounced upon by a prior patentee, and had to pay twice for the same invention. He thought it little better than robbery. We inquired if he had caused examinations to be made as to infringement beforehand. He admitted that he had not. He ought to have blamed his own shortcoming, and not the patent system, for the losses suffered. The publishers of this paper will be happy to correspond with parties who desire searches made as to the scope and validity of patents, infringements, titles, assignments, etc. We have access to all models and drawings in the Patent Office, and employ, as occasion requires, the ablest experts in drawing up opinions and reports.

CEMENT FOR WOOD VESSELS.—A mixture of lime clay and oxide of iron, separately calcined and reduced to fine powder, then intimately mixed, kept in a close vessel, and mixed with the requisite quantity of water when used. This will make a vessel watertight if the ingredients are good.


## WHAT CAN BE DONE FOR INVENTORS—ADVICE GRATIS AND ADVICE FOR PAY.

For the information of our new subscribers, we would state that it is the custom, at the office of this paper, to examine models or drawings and descriptions of alleged new inventions, and to give written or verbal advice as to their patentability, without charge. Persons having made what they consider improvements in any branch of machinery, and contemplating securing the same by Letters Patent, are advised to send a sketch or model of them to this office. An examination will be made and an answer returned by early mail. Through our Branch Office, located directly opposite the Patent Office at Washington, we are enabled to make special examinations into the novelty and patentability of inventions. By having the records of the Patent Office to search, and the models and drawings deposited therein to examine, we are enabled to give an inventor most reliable advice as to the probabilities of his obtaining a patent. For this special examination at the Patent Office we make a charge of Five Dollars. It is necessary that a model or drawing and a description of the invention should accompany the remittance.

The publishers of this paper have been engaged in procuring patents for more than TWENTY-FIVE years, during which time they have acted as attorneys for more than FIFTY THOUSAND patentees. A large proportion of all the patents taken by American citizens in CANADA and FOREIGN COUNTRIES are procured through the agency of this office.

For further particulars as to what can be done for inventors at this office, see advertisement on another page, or address

MUNN & CO.,
No. 37 Park Row, New York.


## SCIENTIFIC AND PRACTICAL INFORMATION.

### HOT WATER SPRINGS.

The common theory that springs are sustained by water first falling from the clouds is generally admitted to be philosophical, and it requires no particular effort of imagination to comprehend the fact. To whatever depth it may penetrate, it must go through crevices and dislocations of rock strata. Pressure from accumulating water above—the upper end of the siphon—for such is the true character of the channel in which it flows—forces the column up at the other extremity from a lower level of the ground.

But hot springs are puzzles to many geological theorists; there are various explanations to account for them, yet nothing is quite satisfactorily settled. Perhaps the most reasonable is this: The water descends to a much lower point than does cold spring water, and is thus brought into direct contact with heated materials of some kind, made so by proximity to internal subterranean fire. There it is instantly converted into steam and forced, through other outlets, upwardly, by a force behind. Before arriving at the surface, it is condensed into water again, retaining an elevated temperature, varying according to the distance it traverses.

### EAR TRUMPETS.

Nothing is more difficult than to make or suggest anything new. There is an ever ready somebody to question a claim to an invention, and to accuse authors of having borrowed or stolen the views or expressions of others. With that fact before our eyes, most persons will agree that all the known contrivances for assisting deaf ears to hear are not only awkward, uncouth, clumsy things, but are generally constructed upon unphilosophical principles.

Tin horns, bell-shapen tubes, flexible pipes, etc., are saleable articles, but poor assistants for gathering and concentrating sonorous vibrations. The external ear, with its elastic cartilage and deep gyrating furrows (on the plan of a series of inclined planes) terminating in the *meatus* leading to the inner acoustic apparatus, was satisfactory to that Supreme Intelligence which constructed the organ. No other form or shape is so perfect in that respect. Now, whoever makes a thin metallic model of the outer ear, large enough to give ten times more surface for arresting atmospheric vibrations, will be successful where other mechanical schemes hopelessly fail. Nature invariably presents the true pattern for us to follow, animals being simply animated machines.

### BLEEDING FROM THE LUNGS.

From violent exertion in lifting, and indeed in various ways in which workmen overtax their muscular power, particularly where masses of metal, heavy timber, and the like are to be moved, a rupture of a vessel may occur in the delicate tissue of the lungs. When such an event happens, the best course to pursue is to swallow several teaspoonsful of fine salt, at intervals of a few minutes. A rationale of its action in arresting pulmonary hæmorrhage may be discussed by physicians. That it is more effectual than any styptic in common use, is certain. A quiet, horizontal position and a repetition of the salt, should blood reappear, offers the most relief. Dosing the stomach with drugs, to arrest the flow from a bleeding vessel in another organ lodged in another cavity, is unphilosophical. So it may be said of the salt; but its influence is more direct—and how? some one may inquire.

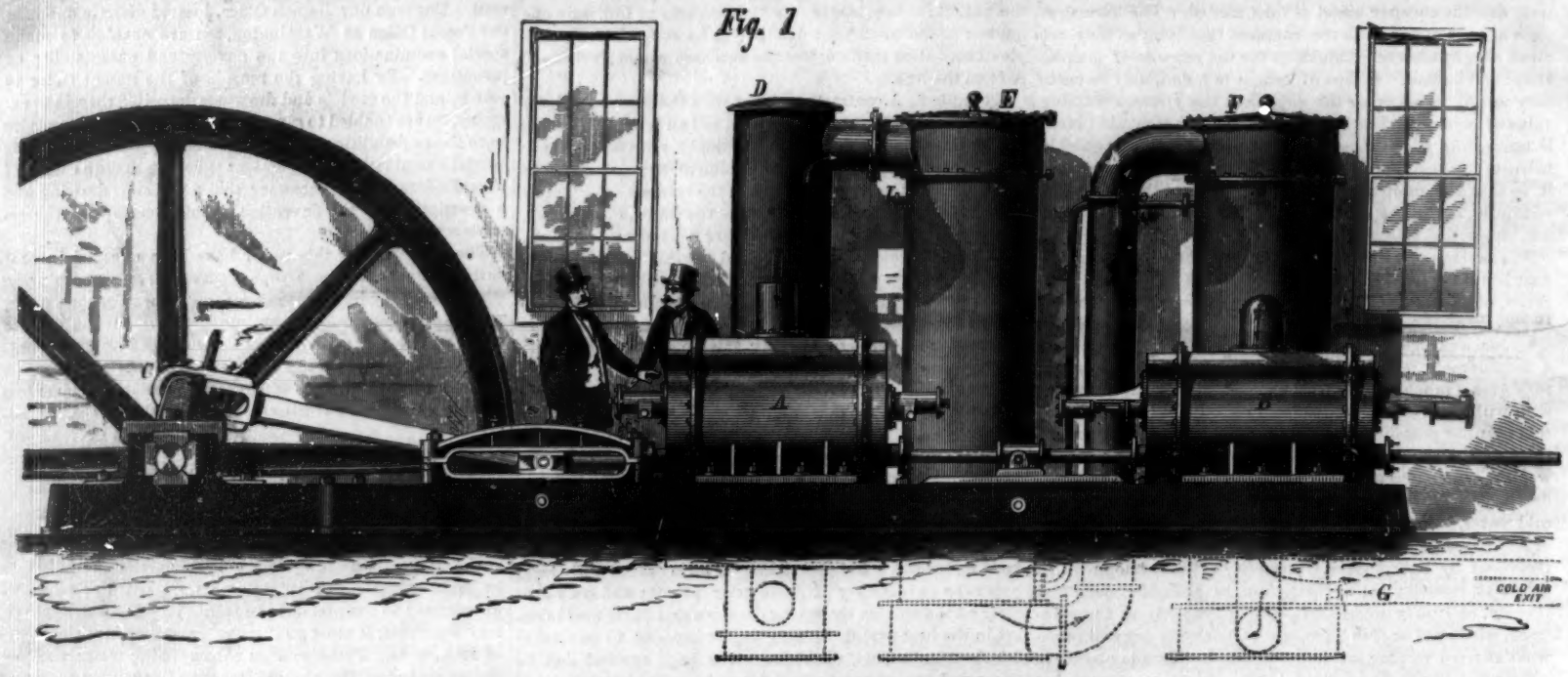
Very often a supposed hæmorrhage from the lungs is lesion of a bronchial vessel in the mucous membrane of the tube leading to the lungs. Occasionally, the flow comes directly from a ruptured vessel in lining membrane of the stomach. If no irritation or disposition to cough ensues, the case is not grave.

TO MAKE a very strong glue that does not get thick or pasty, dissolve ordinary glue in nitric ether, and add a little bit of caoutchouc.

## IMPROVED ICE AND REFRIGERATING MACHINE.

The various inventions which, during late years, have been devised for purposes of refrigeration, or for the manufacture of ice, may be divided into three principal classes: (1) Those in which evaporation is effected in a vacuum, the process being assisted by the use of an air pump, as in the ether machines of Messrs. Siebe, Tellier, and others. (2) Those in which air is first compressed and afterwards expanded, or, more generally speaking, those in which heat is applied in order to ultimately produce cold, exemplified in the apparatus of Kirk of Glasgow, Mignot of Paris, and the Windhausen invention, to which the following description will more particularly refer. (3) Those in which cold is produced by the direct action of heat without the use of power, as in the case of refrigeration by the liquefaction and subsequent evaporation of ammonia, to which class belong the systems of Carré, Reece, Mort, and others of more recent date. In addition to the machines coming under the above heads, may be noted others employing freezing powders and different hydrocarbons, numbers of which, possessing various degrees of merit, exist both in this country and abroad.

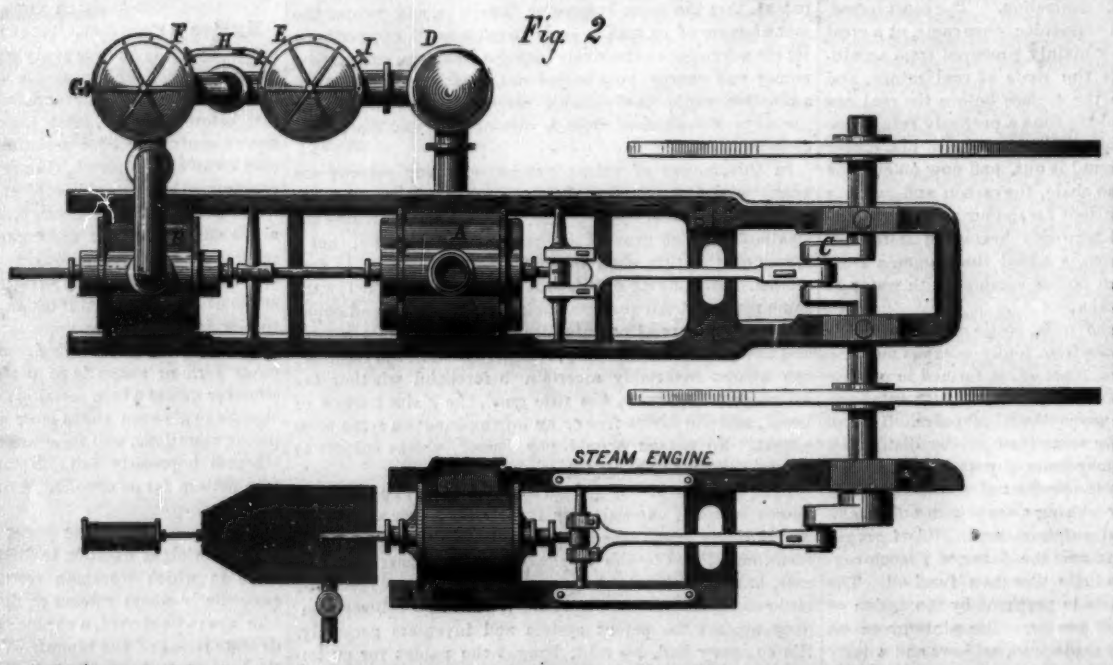
Fig. 1




THE WINDHAUSEN ICE AND REFRIGERATING MACHINE.

The Windhausen apparatus, which our engravings illustrate, was first patented in Germany, and in March, 1870, similar protection was obtained for it in the United States. It has already found general notice in our columns in connection with other devices of similar construction, and may be fairly considered as among the most successful machines of its class yet produced. The principle upon which it is based is one of the simplest in physics, namely, that the compression of the atmosphere generates heat, and its subsequent expansion, cold; an axiom too generally understood to need explanation here. The particular mode of its application in the present instance is, however, an important point; and, indeed, the entire efficiency of the device is claimed to rest upon the circumstance that, instead of cooling the air heated by compression by means of running water, and then conducting it directly to the space or apartment to be refrigerated, it is led into a chamber where dilation takes place. In brief, expansion is effected by the simultaneous action of the machine before the air is sought to be utilized.

Fig. 2




Our engravings present an elevation, Fig. 1, and plan view, Fig. 2. A is the compression cylinder, and B the expansion cylinder, both of which are worked simultaneously by power applied to the crank, C, by the low pressure engine shown in the lower portion of Fig. 2. Air enters in the direction of the arrow into the upper part of cylinder, A, which is of such dimensions that, at every move of the piston, nearly thirty-five cubic feet of air, or, as the former is double acting, twice that number, are compressed by every revolution of the engine. Thirty-six revolutions per minute, for example, compress 150,000 cubic feet per hour, and at a pressure, it is stated, of only 35 pounds per square inch, that is, reducing two and a half volumes of air to one volume. Supposing the air on entrance to be at 80° Fah., it is stated that, after compression, experiment proves its temperature to be 205°, indicating a gain, therefore, of 125°. Leaving the cylinder, A, the current enters the condenser, D, from which, in the direction of the arrow, it passes to a similar receptacle, E, thence down, as indicated by dotted lines in Fig. 1, to another cooler, F. Within these chambers are arranged a series of pipes through which the blast passes, and which are surrounded by a current of cold water which enters at G (dotted lines, Fig. 1), passes up through the cooler, F, through pipe, H, through the next cooler, and emerges at I. The effect of this water is to abstract a portion of the heat imparted by compression, reducing the temperature of the air to a few degrees above that of its natural state, the extent of this reduction depending upon the temperature of the water and the length of time the air is submitted to its action. An atmosphere is thus obtained which, although under two and a half compressions, is but slightly warmer than the ordinary air previous to treatment, while the expansive force and effect of a volume two and a half times larger is retained. Consequently, it is claimed that the 125° of temperature above noted are clearly gained.

In this condition the air enters cylinder B, where the expansion takes place under a gradually diminishing pressure, regulated by automatic valves worked by the simple expansive force of the compressed air itself. To dilate the latter to its normal volume, it is evident that the same amount of heat is required as was abstracted by the water; but this can only be partially returned by the small quantity of air within the expansion cylinder, so that a low degree of temperature is at once obtained. This is still further reduced with every movement of the machine, as the original air in the expansion cylinder becomes colder, or rather replaced by the cooled and compressed atmosphere. As the compression and expansion cylinders are simultaneously double acting, the latter receives its supply only from the former, so that the compressed air is expanded by one and the same process; hence, if 150,000 cubic feet are compressed in one hour, necessarily the same amount must be expanded in a similar time.

From the cylinder, B, the air escapes into the space to be refrigerated with great velocity, sufficient, it is stated, to be capable of conducting the current through channels two feet in diameter a distance of 300 feet from the exit aperture, the measured temperature of the air at the orifice being from 30° to 35° below zero Fah. It is also asserted that, under a pressure of 35 pounds to the square inch, at 33 or 34 revolutions per minute, the machine has, with an inadequate supply of water, since its erection at New Orleans, produced a temperature of 54° below the Fahrenheit freezing point. The apparatus, it is claimed, will sustain a pressure of 85 pounds per square inch, or nearly six atmospheres, producing a most intense cold, scarcely susceptible of thermometrical measurement. Perfectly dry cold air is said to be formed, the contained moisture being condensed into snow and appearing at the exit orifice. This machine, we are informed, has already received the first prize at the Vienna Exposition. The apparatus now operating in New Orleans was built by Eygels, of Berlin, and was the first constructed on a large scale in Germany. The driving engine is 31x36, and works at from 50 to 85 pounds pressure.

The patent right for the entire continent has been purchased by the Windhausen Ice Making and Refrigerating Association of North America. Further information may be obtained by addressing the President of the Company, Mr. J. Kruttschnitt, Lock Box 144, New Orleans, La.

### Learn to Forge your own Tools.

Many mechanics have an idea that, after they have mastered the more legitimate duties of the workshop, they have learned all that is necessary, and can undertake anything in their line of business. Machinists particularly are prone to this error—a common one, by the way—and think that a knowledge of fitting and turning, once acquired, makes up for all other deficiencies. In reality, the self-styled finished mechanic is, paradoxically, the unfinished one; for he who acknowledges his shortcomings, and tries to correct them by obtaining all the information he can, will acquire a more thorough knowledge of his profession. Comparatively few machinists are competent to dress their own tools, or, indeed, handle the blacksmith's hammer on any work. How many times such knowledge would have been invaluable, we leave individuals to decide from their own experience. A simple weld, which they were unable to make, a faculty for dressing chisels without putting their own eyes in danger by striking the anvil instead of the tool, would assuredly have stood persons, ignorant of such details, in good service in time of need. Apprentices who go to the tool dresser to have the edges of their chisels or other instruments renewed, will do well to observe the process and inform themselves of it, instead of throwing coal at the helpers, or otherwise conducting themselves in an unseemly manner. Observation and experience are twins and inseparable, and no youth or, indeed, any adult can hope to attain eminence or proficiency without paying some respect to the matters herein alluded to.

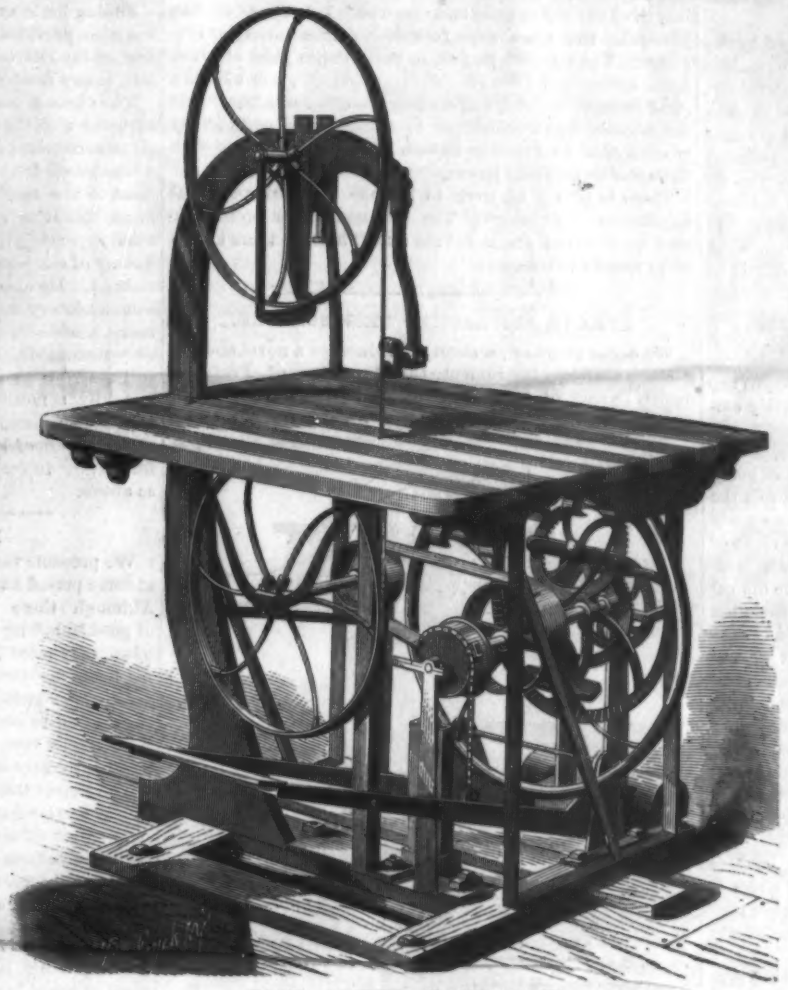
No manufacturer, no engineer, mechanic, or inventor, no person interested in scientific discoveries or industrial progress, should be without the SCIENTIFIC AMERICAN. Fifty-two numbers of 832 pages, and several hundred original engravings, comprise one year—all for $3—with discount for clubs and premium. See Prospectus on another page.

### FOOT POWER BAND SAW.

Our engraving represents another application of the "Vertical Multiplier"—a device which has already been fully explained and described in these columns—to the band saw. As we presume that the general details of the invention are sufficiently familiar to our readers, we consider no minute explanation of principle or working parts here necessary. Actual experience has fully demonstrated and we have convinced ourselves of the fact from a careful inspection that—leaving out all mooted questions of a theoretical nature—by this ingenious combination the motive power is economized to an unexampled degree, through the all but annihilation of frictional loss. That which makes this application of more importance than any other on the same principle made by the inventor is the fact that, so far as we are informed, it is the first successful attempt to operate band saws by man power: and it is perhaps safe to consider that any effort to accomplish the same results, through the old principle of gearing, would prove unavailing.

In the machine depicted, forty steps of the treadle correspond to thirteen hundred and sixty revolutions of the saw pulley. The motion is perfectly continuous, and, so far as we can judge, the saw works with a rapidity and effectiveness little short of that which it would attain if driven by steam. In trials in our presence, the blade divided three inch stuff, and even live oak timber, with great readiness, while sharp curves and scrolls were cut with no apparent difficulty. There is little doubt but that, to wood workers having no steam power conveniences, this application of the invention is destined to form an important acquisition.

We would refer those desiring to examine more closely into the principle, which, it is clear, may be indefinitely extended, to the illustrated descriptions in Volumes XXII. and XXVI. of this journal. Detailed information may be obtained by addressing the Combined Power Company, 23 Dey street, New York city.



FOOT POWER BAND SAW.

### The Value of Patented Inventions.

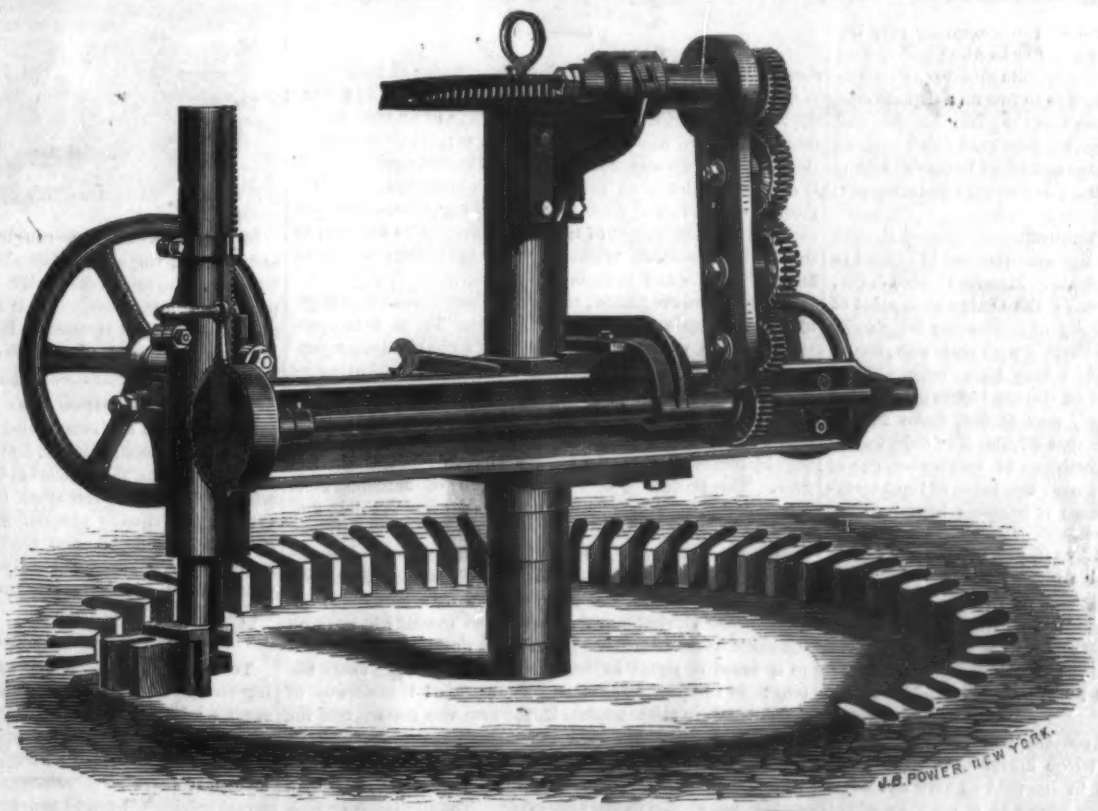
The question is often asked: "How many out of the great number of inventors ever succeed in making their inventions profitable?" We reply that the chances for success in the department of invention fully equals, in our judgment, those of any other branch of business. We do know that many of the leading industries of the country were founded upon patented improvements, and are successful at the present moment simply by reason of the protection afforded by such patents. The frequent transfer at our office of patent rights and the information derived from our correspondents of their success in selling territorial or shop rights, substantiate our belief that patented inventions are valuable when managed with good business tact.

### IMPROVED WHEEL MOLDING MACHINE.

The improved machine represented in the annexed engraving is adapted to the molding of every variety of gear wheels, pulleys, etc., from 9 inches to 14 feet in diameter, and from 1 inch to 18 inches face. The number of teeth range from 10 to 426.

There is a central pedestal, which is secured to or embedded for some fifteen inches below the floor of the foundery, and which serves as a support for the vertical shaft upon which the machine proper revolves in a horizontal plane.

The apparatus consists of a fixed portion and a slotted horizontal radial arm, the latter of which, by means of the wheel partially shown at the right of the engraving, acting upon a traverse side screw, is so moved as to alter the length of said arm with reference to the center of the vertical shaft, sliding it out or in upon its support, and thus adjusting the diameter of the mold. At its outer end the arm carries a vertical sliding ram, which, by the large hand wheel acting on suitable gearing, may be raised or lowered, carrying with it the segment of pattern attached to its lower extremity. At the upper end of the central shaft is rigidly secured a carefully made worm wheel which communicates, by a set of change wheels, with a horizontal longitudinal shaft, operated by the hand crank shown at the left of the engraving. By means of this mechanism, the machine is rotated over an angle corresponding to any desired pitch. This is effected as follows: Of the five small cog wheels shown, the three in the middle merely transmit motion; the two, respectively on the handle and worm shafts, are adjustable, that is, they are attached to their supports by keys, and hence readily detached in order to allow of others being substituted. A set of wheels are therefore necessary accompaniments to the machine, and these are numbered to correspond with suitable directions for making the alterations. For instance, suppose that a ten tooth wheel is to be molded; a cog wheel numbered 90 is affixed to the handle shaft, another marked 45 to the worm shaft, while the crank is rotated nine times. The horizontal portion of the machine is thus revolved over the requisite angular space, equal to that intervening between two consecutive teeth, the segment of pattern being, of course, previously lifted clear of the sand. When this motion is completed, the ram is brought down and a sand tooth molded, and thus the operator continues until the wheel is complete. For 426 teeth, the process is the same, except that other cog wheels are placed in position and the crank turned but half a revolution. The handle, it should be noticed, is combined with a circular rim, on which are suitable marks, which accurately indicate quarter and half turns. In order to accommodate any desired width of face, the entire horizontal portion of the apparatus may be adjusted as to its hight upon the vertical center shaft.




SCOTT'S PATENT WHEEL MOLDING MACHINE.

The advantages claimed may be enumerated as follows: A large saving of time and expense due to the non-requirement of a full pattern wheel, the manufacture of which is a tedious and costly operation. The only woodwork needed is the segment of two teeth. The defects in finished work, arising from contraction and expansion of patterns by atmospheric causes and the consequent repairing necessitated, are avoided, together with the expense of storing and insuring a number of such cumbrous articles. More perfect castings are afforded than can be gained from patterns, from the fact that the teeth may be made of uniform size on both sides, while ordinarily they are constructed smaller upon one edge than the other, to enable the pattern to be drawn from the mold. Finally the hard crust of the cast iron is preserved, thus giving the work additional durability. Further particulars may be obtained by addressing Mr. C. A. Cheever, Treasurer of the New York Molding Machine Company, No. 98 Chambers street, New York city.

### Distillation by Cold.

This is a method recently invented by Mr. H. Smee, the inventor of the electric battery bearing his name. The apparatus is exceedingly simple, and the extent of its application, combined with its simplicity, may make it useful to perfumers and chemists. To determine the amount of ammonia or certain organic impurities, as they exist in the atmosphere, the apparatus is constructed as follows: An eight inch glass funnel, having its lower end drawn to a point and closed, is supported upon an ordinary stand and filled with ice. Below the closed end of the funnel a suitable receiver or flask is placed. As the sloping sides of the funnel are cooled by the ice, a condensation of the watery vapor in the atmosphere takes place—an action precisely similar to that often observed on the sides of an ice pitcher during the summer. As the dew which collects upon the funnel increases in quantity, it finally assumes the form of drops, which, running down the sloping sides, fall into the receiver beneath.

The total quantity of liquid collected in a given time is measured, and the amount of ammonia contained in it determined by Nessler's test. By this same method the inventor found it possible to distil many substances which are decomposed at a high temperature. Thus many delicate odors of flowers can be distilled by placing the flowers under a bell glass sufficiently large to cover the funnel containing the ice. As the moist atmosphere, in which the odors are also present, is condensed, the liquid formed retains a certain portion of the scent of the flower. The odors are more rapidly and completely abstracted by placing a dish containing ether under the bell glass at the time of distillation. Alcohol would probably serve the same purpose, in which case the resulting liquid would be similar to that often obtained by perfumers.

### Hardening Steel Tools.

The following composition, suggested by the chemist Kulicke, has been employed with success at Saarbrücken for restoring burnt steel to its primitive condition; and as it affords a peculiarly hard metal, it is also used for tempering steel tools that are too soft, or may have become so by use, as chisels, saw blades, etc. Burnt steel, heated to a cherry red and forged somewhat on an anvil, is plunged into a well mixed doughy mass (in a box near by) composed of tartaric acid, 6 ounces; cod oil, 30 ounces; charcoal powder, 2 ounces; bone black, 8 ounces; beef tallow, 10 ounces; yellow prussiate of potash, 5 ounces; and burnt hartshorn, 3 ounces, and is then completely treated.

Small articles of cast iron, such as wheel boxes, axle bearings, etc., may be successfully case-hardened by being plunged red hot into a mixture of ten buckets of urine, five pounds of whiting, and four pounds of salt.

### The New Telescope at the Capital.

A correspondent of the *Tribune* thus describes the sights of interest in Washington and the new Clark telescope: It is not to be wondered that a stranger, on making his first pilgrimage to the political metropolis of the country, should find himself gazing with admiration and pride on the vast proportions of the dome of the Capitol. He bestows his admiration, as thousands have done before him, on a great and lasting monument of architectural skill.

In a distant part of our city, scarcely to be noticed by the stranger and almost unknown to many a Washingtonian, are the twin domes of the nation's astronomical observatory. No stupendous piles of architecture meet the eye of the visitor here; but hid in modest seclusion beneath the larger dome, is the monster telescope. For thirty years the observatory has contented itself with the use of an equatorial instrument of puny dimensions, such as many an amateur possesses. Congress, with its accustomed munificence in its contributions to science, some years since appropriated $50,000 for the construction of a telescope which should be a true representative of the present high state of advancement in the manufacture of such instruments, and a powerful agent in astronomical research. The construction, which was undertaken some years since, has been successfully completed, and the telescope now is being mounted at the observatory in Washington, and will soon be actively employed in the nightly vigils of the astronomer.

Our own countrymen, the Clarks of Cambridge, Mass., who constructed the instrument, carry the laurels of being the most successful optical artists in the world. From the smallest beginnings in telescope-making, they have made steady progress till they have reached the present stage of excellence. This instrument is of American manufacture. The only foreign element in its construction are the optical lenses. Optical glass is only to be obtained by importation from abroad. The different parts of the instrument are so finely proportioned that its immensity is lost sight of, and the visitor on first acquaintance might not give full credit to its vast dimensions. The protecting building is circular in form, and about forty feet in diameter, and is surmounted by a dome of the same diameter, resting on a circular system of wheels so that it may be readily revolved through the whole or part of a circle. The dome is provided with a slit six feet in width from the horizon to a little beyond the zenith; this is protected by a sliding shutter.

The telescope is equatorially mounted, that is, it has two axes of motion at right angles to each other, one of which is parallel to the earth's axis; consequently the telescope may be made to follow the diurnal movement of a heavenly body by revolving it on this latter axis alone, which is commonly called the polar axis, because it is directed toward the pole of the heavens. The instrument rests on a pier of stone and brickwork, whose foundations are 18 feet below the surface. The pier is capped by a single block of sandstone, weighing about two tuns. On this stone rests a heavy iron casting, some seven feet in hight and weighing one and a quarter tuns, which supports the entire instrument. The weight of the moving parts is about four tuns. The facility with which this immense mass can be moved is certainly surprising. The gentle pressure of the hand is altogether sufficient. The center about which the parts of the instrument move is about 17 feet above the floor. The telescope tube is of sheet steel, riveted together like the funnel of a steamboat. It is somewhat cigar-shaped. The length of the instrument is 32 feet 6 inches. When it is pointed directly over head, the object glass is elevated 35 feet above the floor.

However wonderful the parts of the mounting may be, the greatest interest will always center in the giant eye of the monster. When it is said that this measures in available diameter 26 inches, it conveys to few an adequate conception of the patience and skill of the glass founder, and his oft repeated failures before he produced disks without a flaw, or of the vast experience and effort bestowed on the disks by the optician in bringing them to an absolutely perfect figure.

The standard of purity and uniformity of density in optical glass is so very high that the manufacture is limited in Europe to very few establishments. Messrs. Chance & Co., of Birmingham, England, furnish the Clarks with most of their optical glass. The difficulty of fabricating large disks of optical glass increases very rapidly with their size; consequently large disks command a very high price. Thus, while the disks for the lens of the 18½ inches glass of the Dearborn Observatory, Chicago, cost $2,000, those for the 26 inches glass at Washington cost $7,000. The object glass of every achromatic telescope consists of two lenses, one of flint and the other of crown glass; the beam of light transmitted through them produces a colorless image at the focus.

The instrument is furnished with finely graduated declination and hour circles. For reading the circles, the divisions under the reading microscope are illuminated by passing a powerful current of electricity through a small platinum wire, which is thereby raised to a white heat. The two microscopes for reading the declination circle are so situated that they may be read by the observer while at the eyepiece of the telescope.

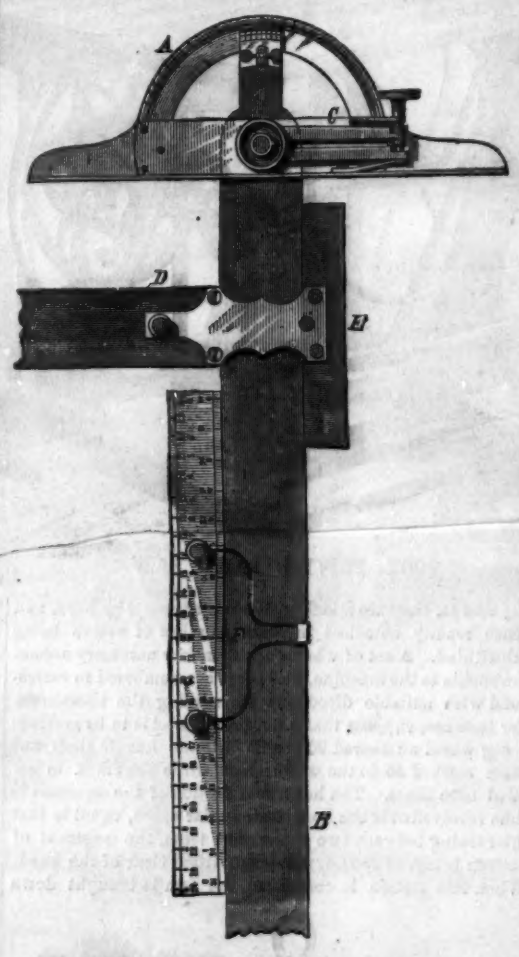
The pier of the instrument contains an archway, in which is mounted the clockwork which moves the telescope, so that an object may be held in the field of view as long as may be desired. The motive power is a reaction wheel, driven by aqueduct water at the rate of three turns in a second. The regulating apparatus is a conical pendulum, revolving once in two seconds, which is automatically controlled by an electro-magnet, which permits friction on a revolving disk when the velocity is too great, and removes it when it is too small.

The question is often asked: How much does this telescope magnify, or how much more does one telescope magnify than another? Such questions can never be answered in the sense in which they are asked, because the magnifying power of a telescope is not a certain fixed quantity. The magnifying power depends on the ratio between the focal length of the object glass and eyepiece. Telescopes of any particular size are always furnished with a variety of eyepieces. The size and perfection of the object glass of a telescope determine its power. A large object glass affords a great amount of light, and renders the effect of atmospheric disturbances less troublesome to the observer, and thereby enables him to examine objects with greater facility with the same magnifying power.

There is plenty of work to be done with this powerful implement of discovery. The astronomer has no need to shed tears, as did Alexander the Great, because there are no more worlds to conquer.

### LYMAN'S PROTRACTING TRIGONOMETER.

We called attention, a short time since, to a novel and ingenious drafting instrument, the invention of Professor Josiah Lyman, of Lenox, Mass. With this device, an engraving of which we herewith present, it is stated that all




rectilinear work may be laid down upon paper or measured, and all trigonometrical problems solved reliably to a minute of a degree in angle or the thousandth of an inch in distance. We are assured, and from a careful inspection of the apparatus we consider the fact to be well substantiated, that it is as reliable as the best field instruments, while for most purposes it will render the use of logarithms unnecessary. The employment of traverse tables is also avoided, so that in all ordinary trigonometrical operations no small amount of time and labor is thus saved.

Briefly, there are united, in a single instrument, a protractor, sliding scale, T square, and sliding T. A is the protractor frame, which is provided with a double lip, projecting downward and upward from the edge constituting its base, to be placed against the metallic border of the drafting board when used, with either face upward as occasion may require. The limb is graduated to half degrees, reading, by means of the adjustable vernier, to minutes of a degree. The protractor arm, B, is made of hardened steel plate, 3 inches wide, one fourteenth of an inch thick, and from 20 to 30 inches in length. There is connected with the pivot a tangent arm, C, as shown, for nice motion. D is the sliding T, which is applied to the protractor arm on the right or left, taking the place of the end borders of the drafting board, enabling the operator to extend his work on the same sheet or roll of paper to an unlimited length and to a breadth equal at least to a foot more than twice the length of the protractor arm. The parts of this portion of the device are the headplate E, the arm, the screws, and the connecting plate. By means of adjusting screws, the head plate is brought exactly at right angles to the arm; and while being used, is held in contact with the latter by a spring, not shown in the engraving. The sliding scale, F, is so arranged that angles and distances are laid down upon paper at the same moment without changing the instrument, the divisions being graduated reliably to the thousandth of an inch, and marked on edges beveled to such an angle (of 30° with the perpendicular) that the needle point in dotting distances is held plumb at the instant of dotting. The marks are made of the requisite depth and width for guiding the needle entirely down to the paper and thus securing it against error. The scale is held in contact with either side of the protractor, or T arm, by means of the wire spring and lip shown, so that every point on the board is within its reach for any desired angle or distance.

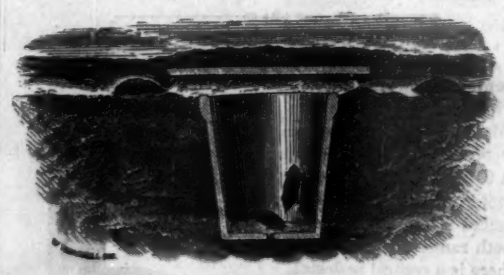
Sliding limbs or arcs, not represented in our illustration, are also provided and so arranged that the meridian, or 0 line, of the instrument can be shifted 45° or less, to right or left, to any desired degree or minute.

The various portions as described, we are informed, are adjusted with the utmost care by the manufacturer, so that all imperfections of construction are eliminated before the device leaves the shop. The inventor states that the implement is the result of some fifteen years' study and experiment, that it is made by the best workmen under his personal supervision, that he fully guarantees it to possess every quality of convenience, accuracy, and expedition of operation claimed. He also has submitted to us a number of highly commendatory testimonials received from well known engineers, professors and others. The cost of the instrument is very reasonable, and a manual is supplied with it, containing full descriptions of its uses and applications. The device is really a meritorious and excellent invention, and well worthy the attention of surveyors, engineers, architects and members of kindred professions. Orders and enquiries for further information should be addressed to the inventor as above.

### HOW TO CATCH MOLES.

We presume there are few of our agricultural readers who at some period have not heartily anathematized the moles. Although these little animals do a considerable amount of good in killing insects and worms which would destroy grain, they more than counterbalance the benefits they confer upon the farmer by the injuries they inflict upon the work of the gardener. They appear to have a taste for the choicest bulbs and for the roots of the rarest flowers, while their tracks very speedily ruin the appearance of smooth and neatly kept lawns.

The Patent Office records show that plenty of inventive genius has been expended in attempts to devise an efficient mole trap. Of these inventions we have tried quite a number in our efforts to rid our garden of the nuisance, but we have found none so satisfactory as the very simple plan represented in our engraving. As soon as a fresh mole run is found, indicated of course by a ridge on the surface of the ground, a hole should be dug and a large sized ordinary flower pot set therein. Over the top of this receptacle, a piece of board is placed, leaving a space of about three inches between it and the edge of the pot, so that dirt from above will not fall into the latter. The openings of the run lead, as represented, into this space. The earth is replaced and the surface of the ground restored. The mole, in following his usual road blindly, comes to the orifice leading to the pot, into which he incontinently tumbles. As he is unable to crawl up the sides or burrow through the hard earthenware, he decides to remain and wait for assistance, which generally comes in the shape of a gardener and a rat terrier. The transactions of the mole with the last mentioned of this pair are such as to destroy his taste for bulbs or for future mining investigations.



In using this device, we caught seven moles on the first day and three on the second day after setting. Since then we have captured one occasionally. The result is a marked improvement in the aspect of our lawn and flower beds. The trap was contrived by George Becker, a gardener in Llewellyn Park, Orange, N. J., and is not patented.

### Protect your Buildings.

Our attention has been called to the superiority of Glines' Patent Slate Roofing Paint, and we take pleasure in favorably mentioning the article on the evidence of acquaintances who have tested it, and speak of its merits in the strongest terms. It is equally adapted for tin or iron; will preserve old or new shingles, and render all roofs waterproof and impregnable to sparks, as in about a month the paint becomes petrified slate. For further information, see advertisement on page 17 of this issue.

TO CLEAN BRASS.—Young engineers will find the following receipe a good one for polishing the brass work of their engines: Rub the surface of the metal with rottenstone and sweet oil, then rub off with a piece of cotton flannel and polish with soft leather. A solution of oxalic acid rubbed over tarnished brass soon removes the tarnish, rendering the metal bright. The acid must be washed off with water, and the brass rubbed with whiting and soft leather. A mixture of muriatic acid and alum dissolved in water imparts a golden color to brass articles that are steeped in it for a few seconds.

## THE MINIATURE TELEGRAPH.

For about a year past we have had in use here, in the office of the SCIENTIFIC AMERICAN, a very simple and convenient little electrical device, termed as above, the Miniature Telegraph, the invention of Mr. Lawrence Duerden, telegraph engineer of the Broadway Underground Railway, in this city. It consists of a pretty little electric bell, shown in its full size in the accompanying engraving, Fig. 1.

THE MINIATURE TELEGRAPH. FIG. 1.

As used in our office, these instruments are placed upon the desks in the various departments of our establishment, and from them wires extend to the desks of the managers, on which buttons are fixed, which connect with the wires. When the manager wishes to communicate with any particular person on the premises, he touches the button corresponding to the wire leading to the bell where the individual is at work. The touch sounds the bell, and, as a variety of signals may be sent, one bell may serve to signalize different persons who are within its hearing. It is surprising how many steps the use of this little contrivance saves, and how greatly it facilitates the transaction of our office business. Previous to its introduction, it was necessary for us to employ messengers, who did little else than run from one part of the premises to another, consuming time and making mistakes. This miniature telegraph saves all such

THE MINIATURE TELEGRAPH. FIG. 2.

troubles, and enables the manager, without leaving his seat, to communicate instantly with all the principal persons employed in the concern. (See Fig. 2.) We have seven of these little instruments in use in our office, which serve us in signalizing a large number of persons. For factories, stores, shops and offices, for dwellings, in lieu of the ordinary bells, for signaling from house to barn, and for all the thousand and one purposes of business and domestic communication, this improvement is very useful. The makers fit up offices and buildings with them when desired. The device is so simple that any person of ordinary intelligence may put up the wire and set into use. It is so made that by shifting a wire from one screw into another it may be used as a telegraph, giving single signals, or as a burglar alarm, making a continuous ringing. The cost is only $5. For this sum, the manufacturers supply one of the bells, like those we use in our office, pictured above, together with connecting wires, chemicals, and a small battery, all complete for working the instrument, with directions for use: neatly put up and sent on receipt of price to all parts of the world by the manufacturers, F. C. Beach & Co., No. 260 Broadway, corner Warren street, New York. At a slight additional cost, the makers supply a larger battery, such as we use in our office, which runs six or eight months without renewal.

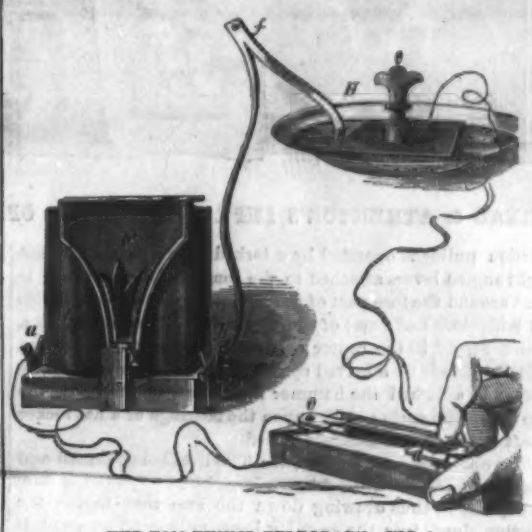
LARGEST BOOK IN THE WORLD.—We read of what promises to be the biggest book in the world. It is now in process of manufacture in Paris, and will contain the names of all the inhabitants of Alsace and Lorraine who have formally proclaimed their wish to remain French subjects. The list is said to comprise 880,000 names. One hundred and twenty-five compositors have been employed on the work during the last three months; it is being printed on seven presses, and the volume will include 13,163 pp. A valuable work, no doubt, but not one which we would wish to read through at a sitting.

## THE TOM THUMB TELEGRAPH.

There is nothing equal to experiment in impressing the facts of science upon the mind. Faraday used to say, with emphasis, to his pupils, that it was not sufficient to read about magnets and electricity. He advised them to make the magnets, use the electrical machines, and thus become, step by step, positively acquainted with the whole subject. As a means to such ends, we take especial pleasure in calling the attention of our readers to the Tom Thumb Telegraph. It affords the means of illustrating the phenomena of electricity, at a cost so small as to be within reach of almost everybody.

The Tom Thumb Telegraph consists of an electro-magnet, sounding armature, a galvanic battery, telegraph key, connecting wires, and chemicals, all complete for working, which, with excellent directions for use, are furnished for $3: neatly packed, and sent to all parts of the world, on receipt of the price, by the makers, F. C. Beach & Co., 260 Broadway, corner Warren street, New York.

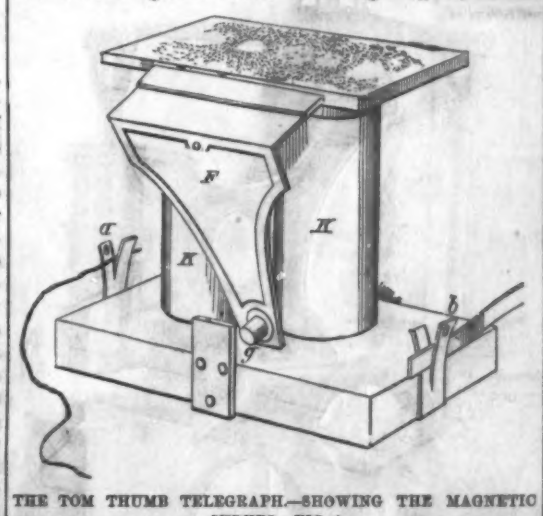
One of these little instruments is now in operation upon our table as we write. We had some curiosity to see what could be done with it, and will here give some of the results: First, as to the battery. It is composed of two small plates, one of lead, one of zinc, the latter covered with paper as a septum, both plates set in a common saucer, in water in which a few grains of sulphate of copper are dissolved. This little battery we found, on trial, to run for two days and a half. The water solution needs to be then renewed, which requires, perhaps, a couple of minutes to do.




THE TOM THUMB TELEGRAPH. FIG. 1.

Next, as to the instrument. It makes a first rate click signal, and is, we think, just as useful for learning the manipulation of the Morse alphabet, and for sending and receiving messages by sound, as any of the larger and more expensive instruments.

In addition to its office as a signal telegraph, this little device may be used for experimenting in many ways, and with it all the principal phenomena connected with electricity and magnetism may be exhibited. Its employment for telegraphing is illustrated in Fig. 1. In Fig. 2 the armature is removed and a slip of glass, with iron filings, placed on the poles of the magnet, K. When the key is pressed, and the glass gently tapped, the filings assume the beautiful positions of the magnetic curves. Removing the glass, needles




THE TOM THUMB TELEGRAPH.—SHOWING THE MAGNETIC CURVES. FIG. 2.

may be magnetized by rubbing on the poles, permanent magnet smade, weights lifted, etc. By connecting one wire with a file and drawing the other wire over the teeth, the electric light, in the form of a sparkling luminosity, may be produced. This is a pretty evening experiment. The electrolysis or decomposition of water into oxygen and hydrogen may be done with the battery, and it may also be used for electro-plating. For these, and other interesting experiments, printed directions are given by the makers. For schools, large or small, the device will be found very useful in the hands of the intelligent teacher, as a means of interesting instruction.

We should find it difficult to select an article of more interest and usefulness for a Christmas gift for young persons than this Tom Thumb Telegraph. It supplies the means for easy self-instruction in one of the most interesting branches of science, with which everybody, old or young, ought to make themselves familiar. These little devices may also be used for office telegraphing as well as for home use and amusement. Any intelligent lad may put up the lines and set them in operation. For further information, and free illustrated catalogues, address the makers as above.

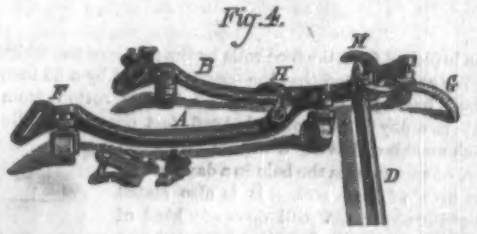
## IMPROVED CASTER FOR SEWING MACHINES.

The invention represented in the accompanying engravings is a novel arrangement of casters and frame, designed for application to the standards of the sewing machine, so that the latter may either be raised upon the casters and thus easily moved from place to place or rest squarely upon the ends of its fixed supports, when in operation. The device is quite uncomplicated, and can be easily attached, while its movement is steady, firm, and positive.

In Fig. 1 the apparatus is shown in action, with the machine supported upon the casters. Fig. 2 represents a part in detail under similar circumstances. In Fig. 3 the standard is seen resting upon the floor, and in Fig. 4 the invention detached from the machine is depicted.

Two bars, A and B, carry the caster wheels secured in the usual manner at their extremities. Pivoted to these bars by arms, C, is a connecting transverse rod, D, the whole thus forming a rectangular shaped frame of suitable size to bring a caster under each leg of the standards. The rod, D, it will be noticed, extends under and parallel to the larger rod, E, upon which the treadle works. The bar, A, at its rear end is connected to the stand by a link or crank arm, F, and the bar, B, at its similar end by an angular slot and pin, as shown in Fig. 3. The arms, C, of the rod, D, also have a bearing against the treadle rod, E.

G, Fig. 2, is a treadle lever pivoted to one of the arms, C, so that when depressed it may abut against a pin on said arm




and at the same time also be moved in a horizontal direction so as to hook under the nearest caster bar, as shown. The effect of this is to throw the casters into action, lifting the machine clear of the floor, and to retain it in such position by locking the treadle lever as above indicated. To return the machine to its ordinary standards, it is only necessary to disengage the lever, when the weight of the machine brings its legs once more to the floor. The relative movements of the machine standards and of the caster frame are in parallel horizontal planes, and are caused by the link or crank arm connections between bars, A and B, and the treadle rod, E, and between same bars and the standards, the angular slot and pin on bar, B, being substantially equivalent to the swinging link connection on bar, A. The portions marked H, are simply hooks which hold the bars from dropping away from the treadle rod, and have no connection with the general operation of the appliance.

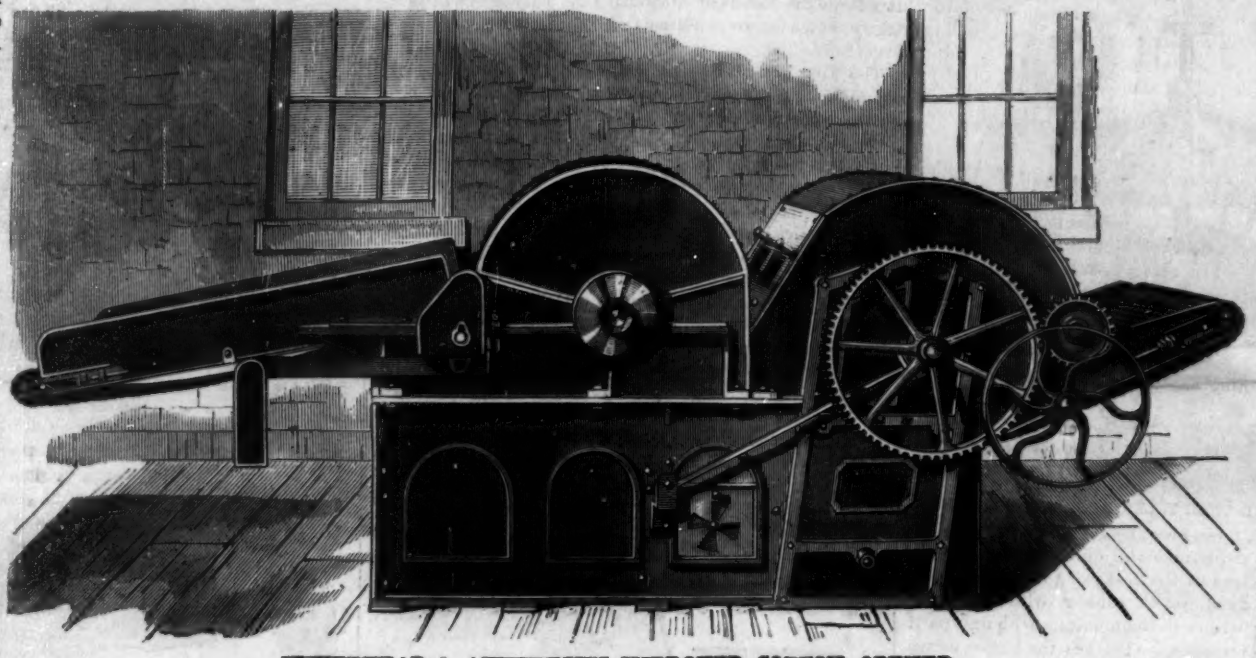
Patents are now pending upon this invention in the United States and Canada. For further particulars regarding sale of rights or the articles themselves, interest in patents, etc., address Mr. G. K. Proctor, 206 Essex street, Salem, Mass.

CHARCOAL is a valuable internal palliative in dyspepsia, and in many of the disorders affecting the stomach and bowels. Taken in doses of a tablespoonful night and morning, it is an almost unfailing corrective of costive habit. Mixed with softening poultices, it is cleansing, soothing, and healing to foul sores. An occasional dose of the powder produces a favorable improvement in sallow or tawny complexions.

BURGLAR-PROOF SCREW FOR LOCKS.—This has a right hand wooden thread at the head end, and a smaller left hand iron thread on the other end, or *vice versa*, the latter being supplied with a nut. An effort to remove it from one side by unscrewing at the head only tightens the nut, while an attempt to drive out the screw on the other side, after taking off the nut, is resisted by the wooden thread.

## IMPROVED COTTON OPENER.

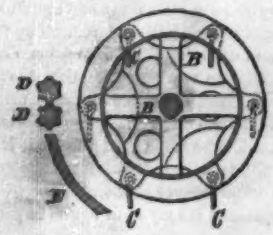
The engravings here shown represent an improved cotton opener made by Messrs. Whitehead & Atherton, of Lowell, Mass., which, it is guaranteed, will open and clean more cotton a day, with no curling of the staple, with less power, less cutting, and less liability "to fire," than any other machine in use. The following is a description of the features and operation of the machine. Fig. 1 is a side view. Fig. 2 is an end view, and Fig. 3 a plan, of the whipper cylinder. A is the driving pulley, B, the rings, C, the whippers, D, two feed rolls, and at E is shown an end view of the grid bars.



WHITEHEAD & ATHERTON'S IMPROVED COTTON OPENER.

The whipper cylinder is constructed of four rings having six steel rods, each rod containing six whippers, arranged when at rest as shown in Figs. 2 and 3. These whippers are hung loosely on the rods, and, when the cylinder is in operation, are thrown out by centrifugal force, striking from the feed rolls in such a manner that the cotton on the entire length of the feed roll is acted upon. Owing to their not being rigid, it is claimed, the whippers cannot injure the staple of the cotton. By striking the cotton parallel with the feed rolls, the same is not "curled," as is apt to be the case in other machines in which the cotton is picked from the feed rolls by the points of the whippers.

Fig. 2.




We are informed that the space occupied by a 36 inch machine, having a capacity of 9,000 lbs. of cotton from the bale in a day of ten hours, is 18x6 feet over all, while a 24 inch machine, having a capacity of 6,000 lbs. of cotton from the bale in a day, covers an area of 10x5 feet. It is also stated that the apparatus will open any kind of roving waste. The above mentioned firm also manufacture compound opener lappers, which, we learn, are capable of opening and cleaning 4,000 lbs. of cotton a day directly from the bale, and of making the same into laps. The same establishment besides construct compound finisher lappers, with their patent evener attached, which have a capacity of 2,000 lbs. of finished laps a day. It is claimed that the laps made on the latter machine are more even than can be produced by the best system of hand weighing known.

Messrs. Whitehead & Atherton have patented their inventions in the United States, Great Britain, France, Germany, and Belgium, and their machine can now be seen in operation at the Tremont and Suffolk Mills, at Lowell, Mass.

## PALMER'S POWER SPRING HAMMER.

In the illustration is presented a view of Palmer's power spring hammer, an invention which, it is claimed, has the advantage of being operated by the same power as is employed to run the works in which it is used, without the additional expense of extra boilers and attendants. The machine, it is stated, can be governed by the foot of the forger so perfectly as to cause it to crack a walnut or to strike a blow equal to a steam hammer of the same grade. The smallest size will deliver 500 strokes a minute, and is especially adapted to forging cutlery of all descriptions, bowls of spoons, small hardware, jewelry, etc. The medium size is designed for the use of a general forge shop, and will strike 300 blows a minute. The largest forms, it is believed, are as well adapted to all classes of work as the steam hammer, while they are free from the expense attending the use of the latter.

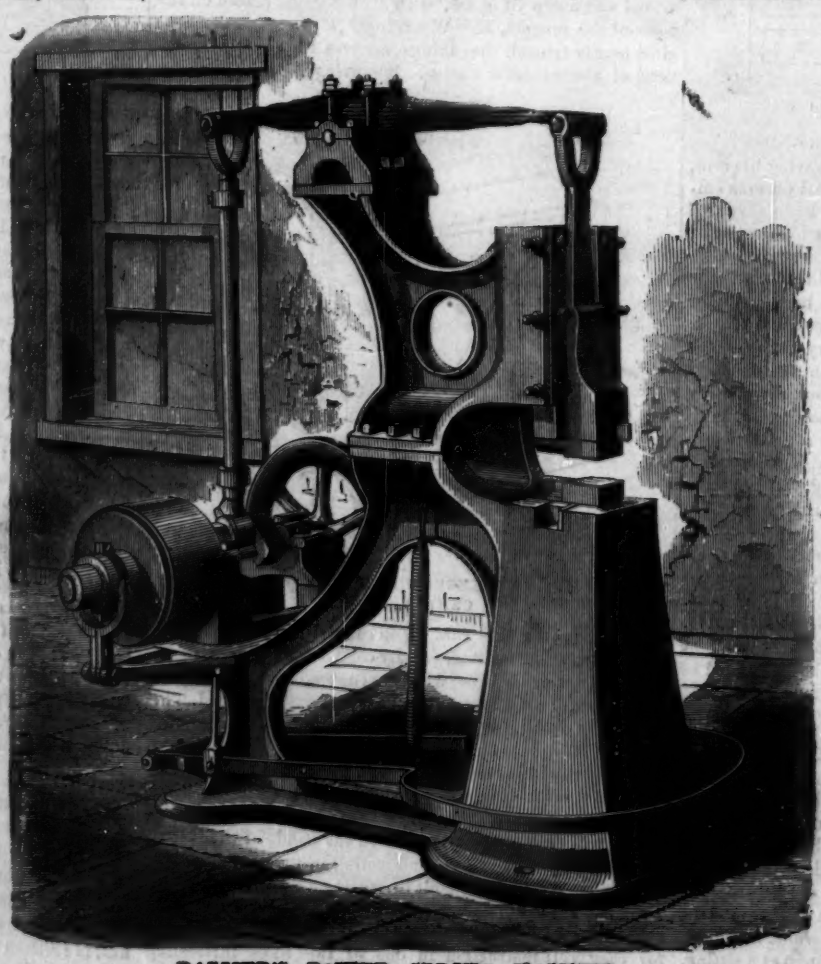
In the engraving is shown a side view of the machine, recently on exhibition at the Chicago Exposition. The dies are made in the usual manner, and are keyed in position. The machine is driven by a friction pulley sliding on a splint in the shaft, the belted pulley being loose on the latter. The friction pulley is operated by a forked clutch worked by the right angled levers attached to the long foot lever, which is bent around the fore part of the hammer so as to be accessible on both sides and front of the apparatus. The shaft has a crank forged in the center and carries upon it a connection which extends to a leaved spring. On the other end of the spring is attached the hammer head, in which is keyed the top die. The spring works upon the bearings of a flat rocker shaft to which it is securely bolted.

The operations are as follows: The iron being heated and placed upon the die, the forger places his foot on the treadle to depress it, thus drawing down the arm that moves the friction clutch into the running loose pulley. The crank is thus revolved, drawing down the spring which carries up the hammer head, and producing by its velocity a vibration of the spring in which the blow given is in proportion to the velocity with which the crank revolves. It is aptly illustrated by cracking a whip.

To forge a long rod or scythe, an aperture cast through the body of the upright part so as to allow the work to be passed lengthwise of the forging dies is provided. The slightest pressure of the foot on the treadle is easily observable in the working of the machine, but the head never allows the dies to meet until there is velocity enough to produce the requisite vibration of the spring. The balance wheel, on the end of the crank shaft, acts in two capacities, the wheel having a balance placed within its rim to counteract the weight of hammer head, thus allowing the hammer to stop in any position in which the friction may leave it, thereby preventing the weight of the hammer head from always resting on the lower die when stopped; and the momentum of the wheel keeps the machine perfectly steady when running, and prevents, by the balance within its rim, that oscillating movement of frame which would be the result of the blow if not thus balanced.

There are, we learn, some twenty of these hammers now in operation in various parts of the country, doing all classes of forging from the smallest forks upward.

Patented by Jos. Palmer, January 9, 1872, and reissued April 29, 1873. The sole manufacturers are Messrs. S. C. Forsaith & Co., Manchester, N. H. Further particulars as to these machines may be obtained by addressing the makers, a description of another of whose productions is given on page 9 of this issue.

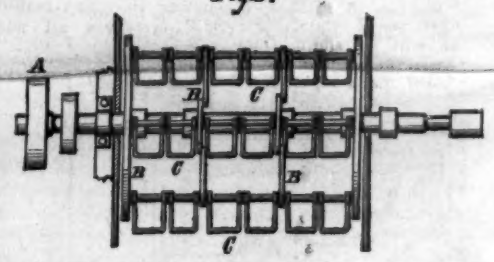


PALMER'S POWER SPRING HAMMER.

## A Tower Taller than Babel.

Messrs. Clarke, Reeves & Co., proprietors of the Phœnixville Bridge Works, Philadelphia, Pa., propose to construct a wrought iron tower, one thousand feet in hight, to be completed for the American Centennial Exhibition in 1876. The tower is to be circular in section, one hundred and fifty feet in diameter at the base, diminishing to thirty feet at the top. It is proposed to have spiral staircases winding around the center tube for those preferring to walk up; but elevators will be provided, which are calculated to ascend to the top in three minutes. We have in process of engraving a full page illustration, representing the tower in contrast with St. Peter's Cathedral, Rome, St. Paul's Cathedral, London, Bunker Hill Monument, the Pyramids of Egypt, and other existing tall structures, all of which, alongside of the thousand feet tower, look like pigmies.

Fig. 3.




This is one of the greatest engineering projects of the age, and it is in the hands of constructors capable of completing whatever they undertake. The beautiful engraving we are having executed will be ready for publication in the SCIENTIFIC AMERICAN about Christmas. All new subscribers for 1874 will be furnished with the paper containing the engraving and description of this immense work.

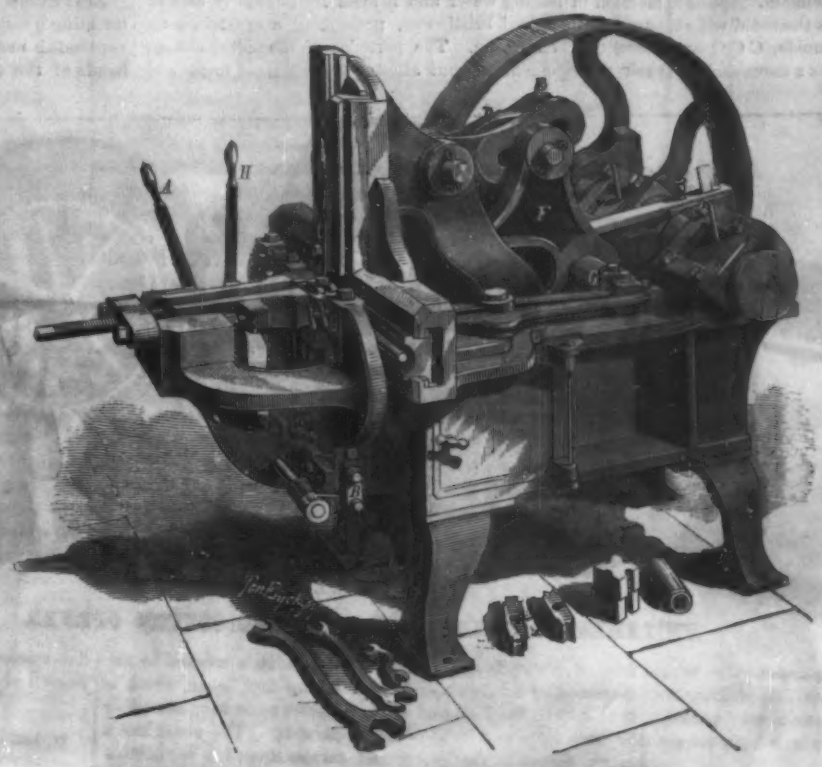
## Embalming the Dead.

In the Vienna Exposition there were several specimens of the embalming of parts of the human body. Those exhibited by Dr. Marini, of Naples, were particularly to be noted. One of these was a large round table made of muscles, sinews, etc., of a dark brown color, with a handsome polish. Among his other exploits he petrified Thalberg, the deceased pianist, and the widow is said to keep the corpse in her drawing room. He also embalmed Mazzini, and so well that some of the more economical admirers of that statesman urged that the body should be set up in Rome as a statue, and thus save expense. The adoption of this suggestion would well test the permanence of the preserved bodies.

### ABBE'S PATENT BOLT FORGING MACHINE.

It has long been a conceded fact that, in forging bolts, the four or six sides of the head should be acted upon by the forging dies without moving the bolt blank from the position in which it is first held, and that the forging dies should be wider than the bolt head, so as to leave no fins on the corners of the head. The object of the inventor of the herewith illustrated machine has been to produce a tool which should combine these advantages with all the requirements of every class of bolt forging. Four dies are used, and the bolt is held firmly and securely in one position until finished, always, it is claimed, producing a bolt, under the head, just the size of the rod, with the sides of the head in parallel lines with the body. All classes of bolts and shapes of head desired are made, especially the fish joint or T headed bolts, which, we are informed, cannot be made on machines where the bolt is turned to receive the action of the forging dies. The production of the apparatus varies, with the size of the bolt to be forged, from eight to sixteen perfect bolts per minute; and changing from one size of bolt to another, or from one shape of head to another, it is stated, requires hardly a moment's time, especially adapting the device to the use of railroad shops.

Among the points of advantage claimed are, first, simplicity; every bolt and joint being dispensed with except those which produce the result of working the four dies, while there are neither gears, cams, nor springs about the machine, thus saving to the user both the expense and the time occupied in making necessary repairs. The slides are all gibbed so that any trifling wear can be readily taken up without removing the slides to put on a thin strip of iron. The sliding surfaces are always running in oil, as they are placed above the water and cinders. The machine is provided with a cupboard for its tools, a new feature in this class of devices.



ABBE'S PATENT BOLT FORGING MACHINE.

The holding vise is operated by a handle, A, attached to the cross shaft. On each end of the latter are the arms, having links, B, attached to work the sliding frame, which opens the radial arms that carry the holding dies. These holders are backed up by a sliding-in piece, adjusted forward by means of the screws. The length of the bolt is gaged from one inch upward by adjusting the end screw. The driving wheel is in operation all the time: the machine only when it is forging the bolt. The long slide carries the bottom die on its lower end. The top slide die, C, works on the face of the long slide, which is actuated by two levers, D, E, having curved slots, the top die slide having one lever with reverse curve, all working on the same pin. The pin in the upset carrier, F, passes through the curved slots, and as it acts back and forth moves them in opposite directions. The side dies have their motion by means of links, G, attached to the upset carrier.

When the bolt blank is placed in the holders and clamped tightly by means of the handle, A, the handle, H, clutches in the driving wheel with the shaft, and the upset carrier advances by means of the connections to upset the iron, the forging dies being all open. As the upset carrier recedes to half stroke, the side dies compress the sides of the head; and at extreme end of stroke, the top and bottom dies act upon the other two sides of the head, and so continue to do until the bolt is finished, which is done in four revolutions of the driving wheel.

Two sizes of these machines are now being manufactured, one for both large and small bolts, and the other more particularly for the smaller sizes.

Two patents have been granted for this header, bearing date of May 1, 1870, and June 6, 1871, respectively, while a third is now pending.

For further particulars address the inventor, John R. Abbe, or the manufacturers, S. C. Forsaith & Co., Manchester, N. H., at whose works the machines can always be seen in practical operation.

### Prescription for Hard Times.

1. Keep cool yourself.
2. Try to keep others cool.
3. Be economical in your expenditures without being close.
4. Be generous in employing others, if their labor will pay actual expense.
5. Remember the more actively money circulates the better, therefore do not hoard up your currency.
6. Pay your just dues promptly.
7. Be accommodating to your debtors. Give time for payment if it can be done without imperiling your own credit.
8. Abandon the credit system as far as possible. Stick to the cash system if you are following it already. Buy nothing on credit that is not an absolute necessity.
9. Subscribe for the SCIENTIFIC AMERICAN and other industrial papers noted for containing practical information; and when not laboring with the hands, store the mind with knowledge of new things.
10. If you have a mechanical taste, see if you cannot invent and patent some new machine or implement, or improve some old one, which will not only bring you a revenue, but benefit others.
11. Above all things keep busy. Have either hands or mind occupied in something useful.

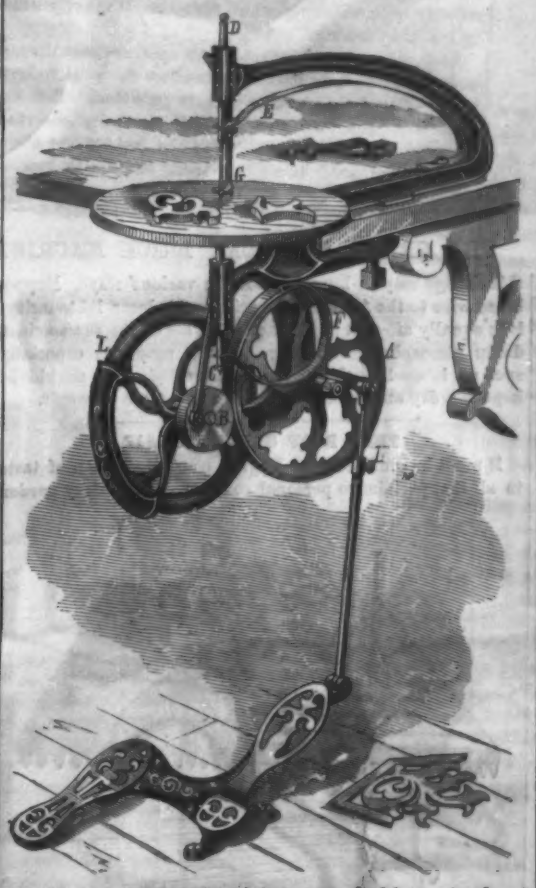
### To Keep Cellars from Freezing.

A friend of ours, who has tried it, says he prevents frost in his cellar by pasting the walls and the ceiling over with four or five thicknesses of old newspapers, a curtain of the same material being also pasted over the small low windows at the top of the cellar. The papers were pasted to the bare joists overhead, leaving an air space between them and the floor. He reports that the papers carried his roots through last winter, though the cellar was left unbanked, and he is confident they have made the cellar frost proof.

Whatever paper is employed, it will be necessary to sweep down the walls thoroughly, and to use a very strong size to hold the paper to the stones. It is not necessary to press the paper down into all the depressions of the wall; every air space beneath it is an additional defense against the cold

### THE FLEETWOOD SCROLL SAW.

Amateurs and makers of such ornamental articles of wood as brackets, scroll work for furniture, decorations, etc., will, we think, find in the invention represented in our engraving a convenient and doubtless efficient tool. It is a jig saw,



portable in form, capable of being attached by a simple set screw to any table, and in construction both neat and simple. Motion is communicated by the feet of the operator to the double treadle, and thence through the rod, H, (which consists of two portions, one fitting within the other, so that it may be operated at any hight of table), to a wheel, A. The periphery of the latter is covered with leather, so that movement is imparted by friction to the pulley, B, and fly wheel thereto connected. In order to protect the garments, a suitable guard is arranged on the exterior of the fly wheel.

At the extremity of the cast iron arm above the table is a guide D, in which works the spindle, to which a saw, coarse or fine, is attached by a simple steel screw clamp, which holds it with sufficient rigidity to prevent too much side play. A constant tension of the blade is maintained by the bent springs, E and F, and the former is actuated by pitman, C, from the pulley, B. G is an adjustable metal foot, designed for holding the work in place while being operated upon. The table is made of iron, veneered above with black walnut, and, with the rest of the apparatus, is carefully and handsomely finished.

The uses for which the invention can be employed are very numerous. Jewellers will find it an excellent tool for sawing gold or silver, making horn jewelry, or working in bone or ivory. It cuts through metal with great ease and accuracy, a fact well proved by some beautifully made samples recently forwarded to us by the manufacturers. Stucco workers and shoemakers will find the apparatus of special advantage in cutting metal patterns, and it is stated that shoe manufacturers can make patterns for fancy stitching at a cost of 1½ cents, where, by the old way, with chisel and file, the expense would be fully 25 cents. For model and pattern makers, the machine will doubtless be of much utility. Printers also will find it a handy article for making mortises in blocks for the insertion of type, as well as for many other uses incident to the composing room.

The work of running the device is very light and as simple as running a sewing machine. Curves of great fineness are easily and quickly cut.

Further particulars may be obtained by addressing the manufacturers, Messrs. Tramp Brothers, Wilmington, Del.

### Florida Cedar.

The Tampa (Fla.) *Guardian* says that few of its readers, outside of Tampa, are aware of the fact that the manufactories of cedar pencils in Germany and other European countries are indebted to this coast for the supply of most of their material; yet such is undoubtedly the fact. This cedar is gotten out and hauled to Tampa in the shape of nicely hewn logs, some ten feet in length, worth, on an average, fifty cents per square foot. This timber is then shipped to New York, sawn into small slips, cedar pencil length, and thence sent to Europe. In the *ante bellum* days there was a large mill in active operation, sawing this cedar; but the proprietor dying, the work was suspended. At this moment the cedar mill is doing nothing, for the reason that the man to whom it is leased awaits suitable machinery from the North. There are a number of boxes packed with sawn cedar lying out in the weather near the mill, some of which are broken open, and contents scattered to rot. The cedar logs, as hauled in by the farmers, are in piles about town, and in heaps along the river. The cedar forests up the river are almost inexhaustible, though, in the swampy hammocks, causeways have to be built to facilitate the getting out of the cedar.

### Craniology in China.

On the authority of F. E. Forbes, of the British Navy, who resided for five years in China, the science of craniology (nearly the same thing as phrenology, one relating to the inside and the other to the outside of the skull), has been taught in that country and studied for centuries before it was dreamed of in Europe. Captain Forbes says that he bought one of their charts, after hearing a lecture, as a curiosity. The craniologist unfolds his plates, and then lectures at great length. One chart represents a human face with a headdress that has not been seen for hundreds of years, inscribed all over with characters. Every feature bears some especial development. "The ears speak volumes," he says, "and the forehead is almost an encyclopedia of organs, some denoting qualities of the mind, while others are emblematic of the destiny of the individual." Some of the symbolic markings on the chart are in circles surrounded by professional expressions. From the forehead to the root of the nose are seven districts: heaven's center; heaven's hall; lord of the firmament; just center; seal hall; old age, etc. Two kinds of eyes are recognised as the exponents of the brain, viz: *ming-he*, clear opening, and *yong-he*, observed opening. There are other particulars given, showing that the *heathen Chinee* not only analyzes character by examining irregularities on the surface of the head, but also learns, through those eminences, the function of parts of the brain lying under them, the real dispositions, tendencies, and perhaps instincts of those under examination.

With the Chinese, craniology has not assumed the dignity of a science, because no science has been refined upon in China. They have unquestionably discovered the existence of principles in many sciences without having raised them above the reach of itinerant pretenders, who thrive by uniting a few facts with an ocean of absurdities. As the masses in China are not educated to comprehend abstract propositions or to escape from prescribed forms of belief, science cannot advance beyond the barrier which custom and government hedges around every man's mind.

REMEMBER that the information contained in the SCIENTIFIC AMERICAN, on mechanical subjects, new inventions and discoveries, cannot be obtained through any other source.

## IMPROVED BRICK MACHINE.

We illustrate this week a recently devised apparatus known as the "Great American" brick machine, in using which, to quote the words of the inventor, "the brick maker has the satisfaction of knowing that, in five minutes from the time the clay is taken from its original bed, it has been thoroughly tempered into a uniform homogeneous mass, pressed into the nicest shaped brick, and placed into the hack, where no more handling is required until the brick are dry enough to enter the kiln." How these excellent results are obtained, the reader will find in the following description:

A, in our engraving, is the pug mill; B is the mold wheel containing twenty-four permanent metal molds, C C C, arranged in groups of three; under the latter is a movable bottom or follower, not shown, provided with a roller and traveling on a circular track, D, which raises or depresses the follower at proper points in the revolution of the mold wheel. Motion is communicated by the main pulley in the foreground by bevel gearing to the upright shaft, G, on the lower part of which a horizontal pinion actuates the mold wheel, B; while near its upper end is suitable gearing, H, which rotates the beaters in the pug mill.

The clay is brought directly from its bed, and not moistened unless it is too dry, in which case a little water is added. The figure on the right is represented as shoveling the crude material into the receiver of the pug mill, within which it is thoroughly ground, tempered, and reduced to a homogeneous mass of about the consistency of thick putty. Thence it is forced into one of the groups of molds, C, which is carried under it by the revolution of the mold wheel, B, a polished metal surface giving the proper smoothness and finish to the top edges of the brick. The follower under the mold wheel then travels up an incline, raising a group of bricks, E, from the molds, all the angles and faces being preserved smooth, sharp, and perfect. As each set of bricks rises from the mold, it is lifted off by the clamp represented in the hands of the figure on the left, and placed upon a double decked truck that is capable of holding one hundred bricks. When filled, the truck is wheeled away and its contents piled in hacks eight or ten bricks high. Each revolution of the mold wheel, therefore, turns out twenty-four bricks, and it is claimed that the machine can produce sixty-five per minute, or thirty-nine thousand in a working day of ten hours.

There is no doubt but that this apparatus is compact, of great simplicity, and economical, in that it produces brick without skilled labor. That it is a decided improvement over the old-fashioned methods of grinding up clay with a superabundance of water, molding in sanded wooden molds, and allowing the moisture to evaporate by spreading the brick in a sanded yard, is also evident. It is neither a "soft mud" nor a "dry clay" machine, but aims at a medium between the two extremes. To continue the list of advantages which the inventor claims, the clay is tempered in the machine itself, so that no separate process is necessary; no molding sand is required, the polished steel molds answering every requirement; no handling or washing of molds, nor edging or spatting of bricks is needed; the bricks are taken directly from the machine to the hack, where they remain while drying, protected from rain and frost. A smaller yard will give the same drying capacity, the hacks being only six feet apart; and, lastly, the bricks can be manufactured at a much reduced cost.

The inventor points to the severe test which his bricks withstood during the Chicago fire, when 50 per cent came out perfect. As an item of interest, we note that the patentee affirms that he has made five hundred millions of bricks since 1865, in Chicago and other points, and that the company working this invention has turned out eight millions during the past season.

For further information concerning this invention, rights, etc., our readers may address the Great American Brick Machine Company, of which E. R. Gard is President, 15 to 21 North Clinton street, Chicago, Ill.

THE GREAT AMERICAN BRICK MACHINE.

### Annealing.

The result of annealing is not generally understood. Nearly all malleable metals assume two distinct forms, which are due to the process which they undergo. If annealed beyond a certain point the metal becomes crystaline, which is the result of slow cooling. If hammered or rolled beyond a certain point, the metal becomes so hard that it cannot be bent without breaking. This form is called fiberous. Take zinc, for instance; it can be drawn into a very flexible and tenacious wire; but submit it to a long immersion in boiling water and it loses its flexibility and resumes its original brittleness, presenting a crystaline appearance when broken. The particles of the metal change their arrangement without altering the external form and this change may be brought about in various ways. Expose brass wire to the fumes of an acid, and it loses its tenacity; it is equally affected by the action of air on its surface in a damp atmosphere. To preserve wire properly, especially such as is used in the manufacture of pins, it should be kept in a dry atmosphere or under the surface of water.

### TENT ROOF GARDEN CHAIR.

It must be confessed our English cousins are men of taste in all that pertains to personal comfort. The dainty garden

chair we illustrate herewith must indeed be a comfortable thing in which to recline and enjoy a fragrant Havana, after dinner. The roof is composed of a roller and two canvas shades, which are wound up or extended at will by means of a brass endless chain. Our readers will agree with us that this chair is a very enticing piece of garden or farm furniture; and as it can be imitated easily, we shall expect next summer to see many of our suburban gardens adopting the luxury. An article executed tastefully, like the one illustrated, will sell, and we hope some of our manufacturers will get them up ready for the next season. A few such tent chairs in a garden would obviate the necessity for a summer house.

### What Becomes of the Sons of Successful Men?

Next to the inquiry: What becomes of the pins? an interesting question would be: What becomes of the sons of successful men? A few men and a few firms are in the hands of the founders; but these are exceptions. The old name and the old trade generally pass into the hands of others. "Do you see that man shoveling in coal? Well, his children, and children like his, will jostle your pampered sons and rule this land," said an old New Yorker, the other day. The old names have ceased in the pulpit. The famed men of the bar seldom have successors. The eminent jurists carry their honors with them to the grave. Merchant princes are obliterated. The reason is clear. The fathers laid the basis of business one way and the sons build another. Men who earned their fortunes by hard work and diligence, and who knew sixteen hours' toil by personal attention, who were their own bookkeepers, salesmen, cashiers, and often porters, are followed by sons who do as little as possible; who delegate to others all the work they can, and who know more of the road than the ledger. Famous hotel men were gentlemen, men of intelligence, men who were the equals of the best in the land, and never sunk the gentlemen in their trade. Young men, who fling the example of their sires to the winds, find it easier to squander a valuable name, run through a fortune quicker than it was earned, and find themselves, while young, at a point from which their fathers started. One thing is quite marked in New York. It is the fact that the heavy business is getting into the hands of foreigners. The heavy importers, the great bankers are foreigners, and much of the trade of value is slipping out of the hands of Americans, as the trade of England got into the power of the Lombards.—*New York Letter to Boston Journal.*

### American Wonders.

The greatest cataract in the world is the Falls of Niagara. The greatest cave in the world is the Mammoth Cave of Kentucky. The greatest river in the world is the Mississippi, 4,100 miles long. The largest valley in the world is the valley of the Mississippi. The largest lake in the world is Lake Superior, which is truly an inland sea, being four hundred and thirty miles long and one thousand feet deep. The longest railroad in the world is the Pacific Railroad, which is over three thousand miles in length. The greatest natural bridge in the world is the natural bridge over Cedar Creek in Virginia. The greatest mass of solid iron in the world is the great iron mountain in Missouri. The largest deposits of anthracite coal in the world are in Pennsylvania.

CHEAP INDIA RUBBER CEMENT.—Cut virgin or native india rubber with a wet knife into the thinnest possible slices, and with shears divide these into threads as fine as fine yarn. Put a small capacity of the shreds (say $\frac{1}{10}$ or less of the capacity of the bottle) into a wide mouthed bottle, and fill it three quarters full of benzine of good quality, perfectly free from oil. The rubber will swell up almost immediately, and in a few days, especially if often shaken, assume the consistency of honey. If it incline to remain in undissolved masses, more benzine must be added; but if too thin and watery, it needs more rubber. A piece of solid rubber the size of a walnut will make a pint of the cement.

This cement dries in a few minutes, and by using three coats in the usual manner, will unite leather straps, patches, rubber soles, backs of books, etc., with exceeding firmness.

### A FORTY THOUSAND DOLLAR COW.

We doubt if more extravagant sums have ever been paid for fancy cattle than those lavished during a recent sale of the herd of the Hon. Samuel Campbell, at New York Mills, near Utica, N. Y., as reported on page 201 of our current volume. Representatives of the most prominent short horn breeders in the world were present, including a large delegation of English cattle stock buyers, consisting of lords and other titled persons.

The breeds which brought the largest sums were Duchesses and Oxfords; and the first animal sold, known as the 2d Duke of Oneida, a three year old bull, brought $12,000. The cow represented in our engraving, known as 1st Duchess of Oneida, was next offered, and, after an extraordinarily exciting contest, was knocked down to Lord Skelmersdale, of England, for $30,600. Subsequently other cattle of the same strain followed at $19,000 and $35,000, and the interest culminated with the sale of the 8th Duchess of Geneva, the dam of the animal in our engraving, which was bought by Mr. R. Pavin Davis, of Gloucestershire, England, for the unprecedented sum of $40,600.

The *Live Stock, Farm, and Fireside Journal*, to which we are indebted for our illustration, says that there were, in all, one hundred and eleven animals presented, and that the amount realized was $380,890. The Duchess herd was originally from England, imported in 1853, and has been since kept in perfect purity in Duchess county, N. Y.

THE CELEBRATED COW, FIRST DUCHESS OF ONEIDA.

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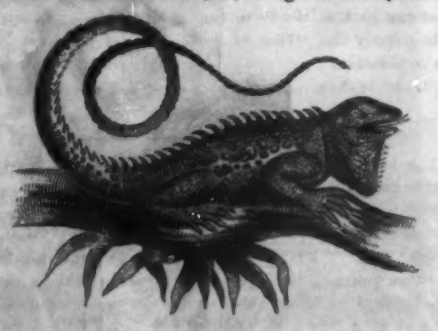
[For the Scientific American.]

### IGUANAS.

Iguanas, or guanas, are a genus of lizards, one species of which is known to zoölogists as the *iguana tuberculata*. They are of a bright green color when young, that hue changing to a dusky brown as the reptile advances in age. According to Webster, the term, Iguana, is derived from the Spanish name given to the animal by the natives of Haiti, in which island the iguana abounds. They are found also in the other West India islands and in some parts of South America. The size of these creatures varies from that of the common lizard, or nuto, to over four feet in length from the nose to the end of the tail. The head is similar in shape to that of an ordinary lizard, and is covered with a scaly armor of a pink color, tinged occasionally with blue and brown. The eyes resemble those of a fowl, and though small are very bright. The back is provided with a serrated comb, which extends from the nape of the neck to within a few inches of the end of the tail. The animal can elevate this or depress it at will, and with its tail can deal a lusty whack, inflicting sometimes a severe gash with this saw-like comb, some anecdotes of which peculiarity will be given further on. In old age, the skin assumes the appearance of old leather, being wrinkled in many parts, and it is so tough that with difficulty can it be penetrated by a shot.

Iguanas inhabit, generally, thickly wooded spots, where they perch on high trees, and, as they are of a green color, they can easily conceal themselves among the branches and leaves while they await their prey. Unlike chameleons, they are very lively in their movements, and will even pounce from a tree to the ground in order to get what they want.

The food of iguanas consists of herbage, insects, and poultry and their eggs, the latter of which they devour with great avidity, and are very cunning in perceiving them. I once saw one of these reptiles attack a hen with her brood of chickens. Darting from a tree, it made a rush at the chickens, on which the mother flew at it and pecked it; but Mr. Guana was not to be outdone, so, though evidently smarting



with pain, it turned round and dealt the hen a lusty blow with its tail, thereby stunning her; and seizing its desired food, it made for its haunt, there to devour the poor chicken at ease. When it had finished this, it returned with full intent to pursue the same course, to which, however, I put a stop by discharging one barrel of my fowling piece at the rapacious monster. As soon as the smoke caused by the discharge had cleared away, I was much surprised to see the guana spring into a neighboring tree. But I was not thus to be foiled; so raising my gun, I discharged the second barrel at it, which took effect, killing it instantly. The spot from which the guana sprung when ascending the tree was marked with blood, therefore I felt assured that the first shot hit it, the more so as there were perforations in the skin of the reptile that had assumed a whitish tinge, which is the case after the charge has been in the body some time.

How true it is I do not know, but it is asserted that the guana is provided with a pouch under its throat, in which it conceals eggs very often. It happened on one occasion that I was out hunting, accompanied by my dog; and, returning I thought I would pass through my poultry yard to ascertain if I could shoot any more of those destructive creatures. I had not long entered the gate when my attention was attracted by a cackling among the fowls, and soon found it to be occasioned by the presence of a huge guana, which was disputing the right of a hen to some eggs upon which she was sitting. Wishful of seeing the procedure of the reptile, I watched it narrowly; it deliberately raised its whip-like appendage and brought it down on the back of the poor fowl; of course, she could not stand that, so she dashed upon it with all her force; the guana, taking advantage of the opportunity, was going to seize an egg to make away with it when I started my dog at it. Ready for defense, the agile lizard raised its tail, and laid it two or three times over the dog, sending her away howling, while it made for the bush hard by.

Although applied with considerable force, the blow given by means of the tail of the guana cannot make an incision through the hair of an animal, or feathers of a bird; but it inflicts a most unsightly wound in the flesh of a man, if the guana be large, and if it apply the serrated portion of the whip to the object of its rage.

The flesh of this disgusting creature is esteemed by some persons as a great delicacy, and it is said that it bears a resemblance to chicken when stewed. The eggs, I believe, are eaten by some epicures, but I think the former has too strong a likeness to that of frog's flesh, and the latter to the eggs of serpents, to be relished by persons not accustomed to such diet.

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THE fact of the SCIENTIFIC AMERICAN having been published by the present proprietors every week for twenty-eight years should be a sufficient guarantee to new subscribers that they will get the paper regularly and all the numbers they pay for.

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### INCUBATING MACHINE.

Mr. W. H. Thick, of London, has devised the warm water egg-hatching machines, shown in our engraving. These incubators are constructed with a reservoir, holding about ten gallons of water. Heat is supplied by gas or by a kerosene lamp, the temperature required for hatching being regularly maintained day and night. Air-carrying pipes pass through the heated water, and carry warm air to all parts of the hatching apparatus, and hot water boxes form part of the reservoir, under which the chicks, when hatched, are placed to receive the heat necessary for their health. The boxes are covered with a lamb skin, or a "wool mother," against which the chickens nestle their backs, while the cool, graveled flooring affords for their feet a surface similar to that which they would have had, had they been naturally hatched. It is calculated that, if proper attention be paid to the instructions, seventy per cent, at least, of strong, healthy birds may be hatched out.

The drawers of the incubators should be strewn with bran, or hay cut into small pieces; but never with sawdust, as the turpentine in the wood tends to destroy the germ in the egg.

We spread a quantity of hay upon the bottom of the drawers, so as to line them completely, and we place fifty hens' eggs in each drawer on the hay, and close the drawers. Heat is communicated from the water in the reservoir, the temperature of which must be about 120° Fah., in order to have the eggs at the required temperature of 102° to 104°.

Twice every day the drawer is opened to turn the eggs, and they are then left exposed to the cooler air of the apartment for a quarter of an hour before being replaced in the machine. When we add that the position of the eggs in the drawer may also be changed three or four times a day, we have given all necessary directions. After an incubation of 21 days, the chickens will break their way out of their shells. They are then left for 24 hours after they are hatched, under the "wool mothers," to dry and gain strength. During this time they are better without food, as the nourishment they have taken before breaking the shell is sufficient to serve them for that period.

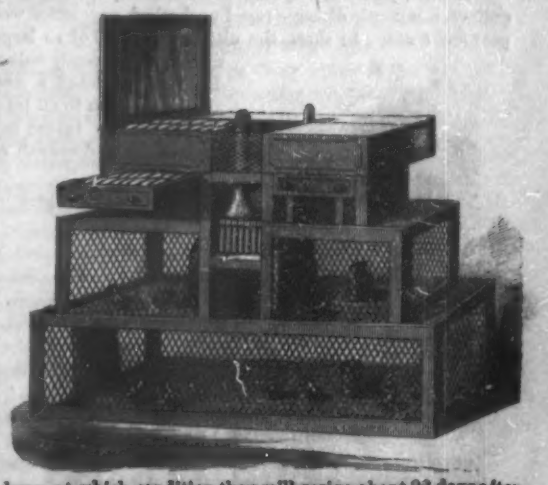
The system of chicken rearing we have described is admirable for the careful observation of natural processes, upon which it is based. Nature has been copied with the most perfect tact, and it is owing to the faithful imitation of her operations and conditions that success has been attained. The reservoir with its flannel covering represents the sitting hen, and the heat that proceeds from the reservoir is of the same temperature, and almost of the nature, as the moist heat which emanates from the body of the parent bird.

The hen on her nest warms her eggs from above, and the incubator is so constructed as to supply the heat from the same direction. The hen turns her eggs once or twice a day, removing those that are in the center of the nest to the outside, and those that are on the outside into the center, so that an equable heat is diffused throughout. This operation on the part of the parent bird may easily be traced by marking the eggs with pencil, and arranging them in a certain order before the sitting commences. In using the incubator the same process of shifting and turning is strictly observed. The hen quits her eggs once or twice a day, for a few minutes—about a quarter of an hour—in order to take the nourishment necessary to sustain life, and thus the eggs are allowed to cool to some extent during the interval, the variation of temperature being considered favorable to the process of incubation. In using the incubator, we take out the drawer, and expose the eggs to the air of the room, thus imitating the natural process in every minute particular.

Timid hens are bad sitters; and if from any sudden alarm a shock is given to the eggs, the hope of chickens may be considered as gone for ever; but in the case of the incubator, with its softly lined drawers, the eggs are not injured, though the apparatus is kept in a workshop in which the din of the hammer is continually heard.

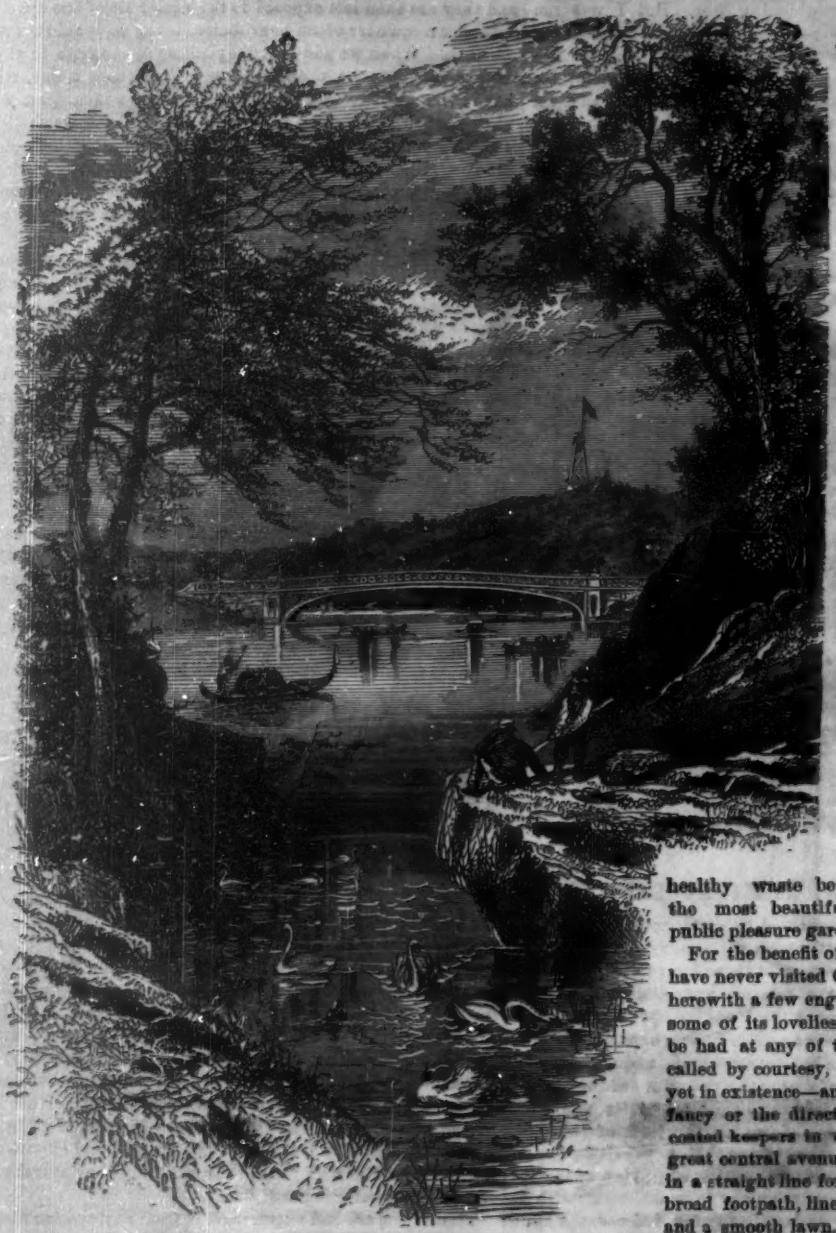
With regard to the economical advantage of using the most improved hatching apparatus, we have to enquire what is the cost of the grain consumed by a hen hatching 15 or 16 eggs only, compared with the cost of the oil or gas required to maintain the temperature in an incubator, hatching 100 or 200 eggs? Experiment proves that the artificial heater costs about two pence every 24 hours, so that the expense of hatching the brood of from 1 to 200 is under 4 shillings. In summer, when the temperature of the atmosphere is naturally high, the expense is considerably less. On the other hand, the brood hen is not fed at a less expense than one penny *per diem*, and at this rate no more than 30 eggs are hatched naturally, at the outlay which, by using the incubator, will insure the hatching of 200. Besides this evident advantage, it is to be remembered that, in artificial hatching, the mother bird is free to continue laying uninterruptedly—thus paying its own way.

When the chickens are hatched, dried, and covered with



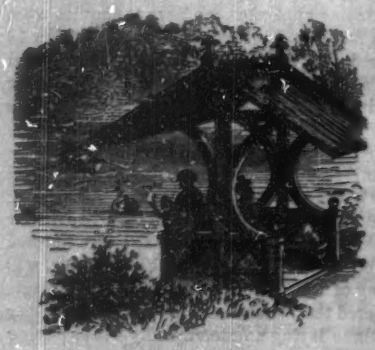
down, at which condition they will arrive about 23 days after incubation, they are placed under the "artificial mother." The water boxes, being properly heated, are covered with lambskin, under which the chickens shelter and warm themselves. In this nursery they are kept and fed for about a week; they are then let out, but still kept near the nursery, the runs of which remain open, so that they may enter when alarmed, or when called to feed.—*Science Record*, 1873.

# VIEWS IN CENTRAL PARK, NEW YORK CITY.



BOW BRIDGE, FROM THE LAKE.

It is not very many years since the central portion of Manhattan Island was a wilderness of swamp, relieved only by great masses of arid and jagged rock. The inhabitants, principally emigrants from the Emerald isle, lived in a state of primeval simplicity and dirt, in rickety sheds and cabins, which at once did duty as dwelling houses and as stables for an occasional cow and innumerable pigs and goats. A more dreary and desolate neighborhood it would be difficult to find; pools of stagnant water bred myriads of mosquitoes, miasmatic diseases raged unchecked, vegetation was poor and scanty, in short, the ultimate disposal of so large a tract of apparently valueless land furnished a continued problem to all interested in the future improvement and growth of the city.



THE BOAT HOUSE.

Such was the unpromising material from which it was decided to produce a park which should rival the celebrated pleasuregrounds of England, and overtop in magnificence the Parisian Bois de Boulogne. Engineers were engaged, the ground was surveyed, and the itinerant population driven from its fastnesses. For years an army of laborers made the great area, of 862 acres, a scene of continuous labor. Bogs and marshes were drained, beautiful lakes replaced fetid pools, substantial roads took the place of muddy cow paths, and graceful bridges were thrown across precipitous ravines. Then followed the landscape gardener, and the dry places became carpeted with velvety turf, the bare rocks covered with creeping vegetation; walks were laid out, trees and shrubs innumerable planted, rustic arbors of exquisite design built in romantic spots, and, finally, the valueless and unhealthy waste became transformed into the most beautiful, if not the largest, public pleasure garden in the world.

DRINKING FOUNTAIN AND BIRD CAGE.

For the benefit of our many readers who have never visited Central Park, we present herewith a few engravings from sketches of some of its loveliest portions. Entrance can be had at any of the numerous gates—so called by courtesy, for no actual portals are yet in existence—and we can follow our own fancy or the directions of one of the gray coated keepers in wending our way to the great central avenue or Mall. Here, leading in a straight line for a quarter of a mile, is a broad footpath, lined with rows of tall elms and a smooth lawn. On Saturdays, during summer, an excellent band plays for several hours in the afternoon in a beautiful pavilion erected for the purpose, and thousands of people gather to listen. Leading from the Mall to the Lake Level is the Terrace, a fine architectural work of Nova Scotia stone, covered with elaborate carving. There are finely executed bas reliefs, emblematic of Night and Morning, the Seasons, and other artistic designs, all exquisitely chiseled from the massive blocks. The stairs down which we pass lead to an arcade under the main Drive, the ceiling of which is inlaid with tile in mosaic work, the design and coloring beautiful in effect, and thence we step out on the Esplanade, a broad plateau on the shores of the lake. In the center is a great fountain, the bronze group belonging to which has recently been placed in position.

RUSTIC SEAT AND FOUNTAIN.

The lake is of almost entirely artificial construction, and covers twenty acres; and to see its beauties we must avail ourselves of one of the numerous gaily painted boats which glide over its surface. Now we pass a bold jutting rock which changes into a grassy slope, spreading far up the hill, then a clump of willows, the overhanging bows of which extend far over the water; then we shoot by an ornamental boat house, with its steps leading down to the water's edge; perhaps we glide in among a flock of swans and ducks, that tamely crowd around to catch bits of bread that we may throw to them. Then as we skirt the shore we catch glimpses of romantic arbors half buried in the trees; and just before our row is over, we run under Echo Bridge, the concave form of which indefinitely multiplies every sound.

The finest piece of architecture in the Park—we may add one of the most elaborate of its kind in existence—is Bow Bridge, shown in our larger illustration. It is made entirely of iron, and the span, in addition to being quite long, is of the beautiful bow shape indicated by the name. We pass over it to get to the Ramble, where the paths are all curves, and crooks, and intricate windings, which we can follow, and retrace again and again, finding new beauties each time. There are vine covered arbors, from which occasional glimpses may be had of the lake and the graceful swans and other water fowl, and quiet nooks where one may rest with a favorite book entirely out of hearing of the rumble and noise of the great city.

THE SPRING.

THE SUMMER HOUSE.

The tower on the hill is the Belvidere, from which a splendid view can be gained, from its upper balcony, over the great Croton basins, the city, and across the Hudson and East Rivers to the shores of New Jersey and Long Island. In the Museum is a very fine zoological collection, comprising many valuable and rare living animals, fine entomological collections, and stuffed animals, as well as a number of fossil remains.

There are several fine statues at present in the Park, among which are those of Shakspeare and Morse, and busts of Schiller, Burns and Humboldt.

Work is still in progress, and every year finds new beauties added to New York's great breathing place. That it is appreciated by the people, the crowds which throng every pathway on Sundays testify, suggesting indeed the thought that even this large expanse will ere long become too small, and another vast park will be needed to supply the wants of our population.

ECHO BRIDGE.

### WINDOW PLANTS.

Nothing adds more to the cheerfulness of a dining or sitting room in the winter, than thrifty, growing plants and vines.

A plain or rustic box, which any one can make with a saw and jack knife, answers for the planting box; and the trellis may be of wire or rattan; or even the twigs from trees, artistically entwined, answer a good purpose. Our engraving illustrates a very pretty arrangement for a bay window, but the form may be varied according to the taste. For filling pots for climbing vines, the best soil is a mixture of equa

parts of garden soil, sand, and leaf mold. A correspondent of the *Tribune* on window gardening says:

We are often too ambitious for variety; we have too many plants, and perhaps none receive sufficient attention. We get a little of everything, and fill our windows with unsightly flower pots, when a single plant, well grown, would be worth the whole of them. An English or an Italian ivy running on the wall, embracing pictures, brackets, etc., does far better service in ministering to a love of ornament and of beauty than scores of such house plants as are generally seen. The pleasure is never proportioned to the number or variety on our list. The finest effects are produced with a few plants, if one is skillful in arrangement and combination. In the broad bay window of one cultivator I have seen several callas, a large rhincospermum, and pots of pink oxalis, so grouped as to appear like a huge bouquet rather than growing plants. Another friend makes a specialty of smilax; she [illegible] in winter, and generally her hanging basket is embellished with numerous sprays from the same redundant vine. The basket is always filled with things bright and pretty, budding and blooming. The smilax runs up the handles and cords to the ceiling, branching out and spreading itself in a most agreeable manner. This comprises her stock of house plants, though her apartments are always made fragrant and cheerful with blooming hyacinths and tulips. Cultivate a few things, cultivate them well.

### LEAF PICTURES.

A beautiful collection of specimens may be made by following these directions, for using which no knowledge of photography is needed. The student of botany will find the process, by Thomas Gaffney, Esq., of Boston, Mass., very useful in the country:

Purchase a few pressure frames (of the size of 8x10 inches and under), at the store of some photographic stock dealer, and a few sheets of sensitive paper from some friendly photographer in the place of your sojourn. This sensitive paper must be kept in some dark place until you are ready to use it; and, as it quickly changes color, only obtain what you require from day to day.

Gather now your leaves and ferns, press them sufficiently to remove any excess of moisture, arrange them in some tasteful manner upon the glass in the pressure frames, fasten them in their position by some thin, adhesive solution, and place a piece of sensitive paper upon the leaves; put on the pressure in an equal manner by means of the hinged backboard and its springs, and then expose it to the sunlight until a very dark impression is produced. The leaf impression

can be examined from the back of the pressure frame, by means of the hinged backboard.

When your day's work is completed, carry your prints; shut up from the light, between the leaves of a book, to your friend photographer, who can tone, fix, and mount them on cardboard, and return them to you on the next day. In your first attempt you may make too light or too dark a picture. But experience will soon teach you how long or short an exposure to sunlight is necessary in any certain month, and under any certain states of the light or the atmosphere, to produce the most effective picture.

It is impossible to foresee all the practical results of this novel and graceful application of a well known art to Nature's mysteries, but it can hardly fail to prove useful to artists, designers, and scholars, while to lovers of the wildwood it opens a tempting prospect.

Our illustration shows an emblematic design first wrought out in leaves and moss, by skillful fingers, and, after being properly placed in a pressure glass, exposed to the sun's rays.

### CITY GARDENING.

It would be a great addition to the beauties of our large cities to have our yards, both front and rear, filled with flowering plants, as effectively arranged as the limited space at disposal would admit. We present herewith a design for a flower basket, which can be easily and cheaply constructed out of materials that are everywhere accessible.

The center pole may be twenty feet high, if desirable. It should be set at least three feet into the ground; and for one foot below the surface of the earth, the pole should be smeared with a generous coat of tar. In the country, an ornamental tree may be employed in lieu of the pole. The basket is made of hoop iron, one inch wide; ninety feet of it will be required, and forty rivets, such as are employed for uniting the ends of hoops for tubs and pails. Such rivets

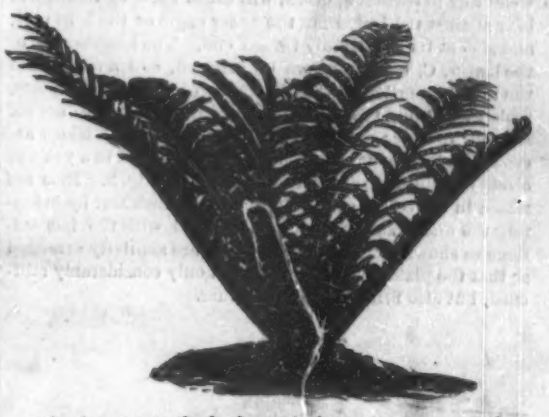
can always be obtained at hardware stores. Let a portion of the hoop iron be cut into thirty-six pieces two feet long for the sides, and one piece twelve feet and three inches in length for the rim. Now punch thirty-six holes four inches apart, exactly in the middle of the long piece, measuring from edge to edge; after which, punch a hole half an inch from the end of each of the pieces two feet in length, and rivet one end of every piece to the hoop rim, to form the sides; then punch two holes near the ends of the hoop rim for the rivets, place the hoop around the post, rivet the ends together, and suspend the rim by wires, extending from the rim to the pole. After which, saw out a plank wheel fourteen inches in diameter, for the bottom of the basket, having the wheel in two equal parts, with a gain in each part to fit the post. After the wheel is nailed to the post, let the lower ends of the side irons be nailed to the periphery of the wheel. Let the iron be smeared with coal tar to prevent rust. The outer side of the iron may be painted. The two horizontal spars are simply nailed to the sides of the post, about seven or eight feet from the ground, and the ends are supported by wires, as shown in the engraving. A small hanging basket may be suspended from the end of each spar, and a neat little bird house also may be secured at the top of the pole. The rim of the large basket post should be supported by at least four or six wires. Ox muzzles, which can be purchased at most hardware stores for twenty-five cents each, will make pretty baskets to be suspended from the ends of the spars. That part of the pole which the large basket surrounds should be well tarred before the earth is placed in the basket.

The soil should consist of fine and rich garden mold, when one cannot procure leaf mold from the woods, with which there should be mingled, say, three or four quarts of sand and the same quantity of ashes, per bushel of mold, with a quart of iron filings or iron turnings.

Verbenas, portulacca, scarlet geranium, abronia, lobelia, mignonette, loasa, sweet alyssum, and many other flowers may be cultivated in such a basket.

### THE DRYNARIAS.

The excellent plan of planting out exotic ferns on picturesque banks, etc., to the hothouse is becoming more popular every day; when well done, its effect is of the most satisfactory kind. The arrangement should not as a rule be confined to ferns. Noble arums, and the single *monstera*, add greatly to the charms of the ferns. But where ferns alone are used, much improvement may be effected by selecting distinct and noble types to contrast with the large and small ferns in cultivation. Among the nobler kinds of stemless ferns we know nothing more worthy of attention, says the *Garden*, than the *drynarias*, shown in the engraving, forming as they do such huge leaves and noble nest-like crests. For rocky or elevated points the species figured (*d. morbillosa*) and *d. coronans* are superb.



### PATENTS IN 1845 AND 1873.

During the long period of the past quarter of a century more than 50,000 applications for letters patent in this and foreign countries have been solicited through the Scientific American Patent Agency. Upon referring to the first volume of this paper (published in 1845) we see that the total number of patents issued from the United States Patent Office each week did not exceed about ten. The total issue for the year 1845, including design patents, was only 519. The issue per week now averages a little over 266; and, according to the Commissioner's last report, there were thirteen thousand eight hundred and eighty-two patents allowed and issued during the fiscal year ending September 30, 1873, an increase of more than twenty-six hundred per cent within a period of little more than a quarter of a century. We flatter ourselves, not only that the SCIENTIFIC AMERICAN has, to no small degree, been instrumental in making the Patent Office one of our most important national institutions, but that it has been foremost in promoting the interests of inventors throughout the land.

### A PERSONAL AWARD OF A SILVER MEDAL AND DIPLOMA OF HONOR.

George W. Baker, assistant superintendent of the Wilson sewing machine manufactory, received a Diploma of Honor and one of the five medals awarded to Americans by the Society of Arts and Manufacturers of Lower Austria, in Vienna, September 27, 1873, for the scientific mechanical principles and the skilled workmanship in the manipulation of the world renowned Wilson shuttle sewing machines. This award is the highest of any made by the Universal Exposition, and was the only one granted for skilled work in the manufacture of sewing machines.

### FRESH GRAPES IN WINTER.

Parties still having grapes on their vines at the end of October or the beginning of November can keep them fresh and juicy by observing the following method: When the first frost comes on, cut the grapes with a considerable stem, having one or two knots below and one above the grape (see engraving). The upper end of the stem is to be covered with beeswax to prevent the escape of the circulating juices. After the grape is thus prepared, remove all bad berries from the bunch, and place the stem in a bottle of water, having a layer of charcoal at the bottom, which tends to keep the water clean; then close the bottle with a cork, letting the stem pass through the center, and the top with beeswax. Grapes prepared in this manner will be sure to keep fresh and juicy all winter.

REMEMBER that the SCIENTIFIC AMERICAN is published every week, and that a single number contains as much matter as many of our monthlies. TRY the paper one year, and you will never do without it.

## IMPROVED SPRING FOR VEHICLES.

The accompanying engravings represent a new vehicle spring, the construction of which is claimed to be such as materially to increase the strength, stiffness, and durability of the plates of which it is composed. The device is made in two divisions, upper and lower, as shown, each containing several leaves. In the engraving, four of the latter are represented, but a greater or less number may be employed as desired.

The two long leaves, A and B, Fig. 1, of the lower division are bent upward and backward at the ends, so as to confine the extremities of the upper plates, C C. It is evident that the elongation of the latter portions, due to the superposed weight or to springing down, will cause such extremities to bear against the leaf, B, at the inner angle of the bent part, and also at its backwardly turned end. The lengthening of the leaves, C, will therefore be arrested, and a reaction of the middle portion of the upper division will take place, which will bring the power of the spring largely into action. In order further to utilize the power, the two divisions are separated by a metal or wood block, D, confined in a yoke, as already indicated in the sectional view, Fig. 2. Ribs are raised in the center of the upper side of each leaf by indenting the under surface, which are nested with the indentations as shown. The block and yoke are similarly arranged so that the plates are, it is stated, not only considerably stiffened, but also firmly secured together.

Fig. 1.

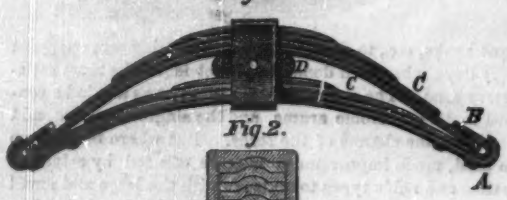



Fig. 2.

We learn that the invention has been quite thoroughly tested in actual use, and that it has proved itself of considerable efficiency. In a letter from the superintendent of machinery of the Seaboard and Roanoke Railroad Company, submitted to us by the inventor, it is stated that the device has been in employment under a passenger engine for six months past, and that it appears as perfect as when first put in place. Much difficulty, it is said, has been hitherto experienced with broken springs. The motion of the locomotive is easy, and the writer adds that he considers the appliance a valuable improvement.

Patented through the Scientific American Patent Agency, by George W. Lewis, September 23, 1873. For further particulars address C. W. Walker, Portsmouth, Va.

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## AN IMPORTANT INFRINGEMENT CASE DECIDED.

The following article appeared in the *Daily Republic*, of October 27:

Most of our readers are aware that for a period of more than four years a suit has been in progress in the United States Court for the Southern District of Ohio, in which the firm of James Leffel & Co., of Springfield, Ohio, were plaintiffs, and Barnett, Herman & Co., defendants, the suit being brought to restrain the defendants from infringing the patents of James Leffel by the manufacture of what is called the Thomas Leffel Wheel. This suit has attracted much attention, being one of the most severely contested, prolonged, and complicated in the annals of patent litigation. The most eminent legal talent in the country has been employed on both sides, and every possible resource has been exhausted by the defendants in attempting to overthrow the Leffel patents, and by this means to prove non-infringement on their own part. In the progress of the case the leading mechanical experts of the country have been employed by the respective parties. After all this preliminary labor, of the amount of which no one inexperienced in patent litigation can form an adequate idea (and the expense of which may be approximately estimated at *fifty thousand dollars*), the case came up for final hearing nearly two weeks ago at Cincinnati.

After listening to arguments of counsel occupying some eight days, Judge Emmons, of the United States Court (Judge Swing of the District Court concurring), in an able and exhaustive decision, fully and completely sustained the Leffel patents in every particular, absolutely confirming their validity, and pronouncing the defendants' wheel and case, known as the Thomas Leffel Wheel, an infringement in all its parts upon those patents, sustaining without exception every claim of the plaintiffs.

A decree has been rendered, in accordance with the above decision, granting an injunction forbidding the manufacture of the defendants' wheel; and the matter has been referred to a Master for the assessment of damages.

This case is one of the utmost importance, as it establishes the validity of claims covering about all the valuable improvements in modern turbine water wheels.

S. A. Bowmen, Esq., of Springfield, Ohio, and Mr. Keller, of New York city, were the counsel for James Leffel & Co., and Hon. Henry Stanbery, of Covington, Ky., and Messrs. Wood & Boyd for Barnett, Herman & Co.

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NEWSPAPER publishers will be furnished with electrotypes from any of the engravings which appear in this number, or in future issues of the SCIENTIFIC AMERICAN, on very reasonable terms. For price, write the publishers.

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### Steel Castings.

*To the Editor of the Scientific American:*

I was no less surprised than gratified, in a recent tour of the Pittsburgh, Pa., manufacturing establishments, in finding the manufacture of steel castings brought so near perfection as is done at the Jackson Steel Casting Works, Wiese, Straub & Co. proprietors.

I find this a new enterprise; the buildings, all of brick, were begun in March last. The first run of castings were made in August, since which time the works have been in constant operation, turning out from 6 to 8 tuns of steel castings per day. With their process (which is patented), they are enabled to produce castings perfectly sound and homogeneous, warranted free from porosity or honeycomb; the latter having been the difficulty heretofore met with in all other processes of making steel castings.

The castings made in these works are remarkable for toughness, making them specially desirable as a substitute for wrought iron, as evinced in the car coupling and railroad frogs made in these works, of which they make a specialty. In addition to these articles, they have made engine cranks, C hooks, links, guides, eccentrics, straps, valves, etc., and various parts of trip hammers that are subject to great friction, pinions for planers, rolling mills, punching machines; and, in short, this steel has been used for hundreds of purposes too numerous to mention. SPARTA.

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### How does Food Nourish Us?

Taking aliments into the stomach is only a preliminary process. There it is mixed with a peculiar fluid which oozes from the inner walls of that organ, which is a powerful solvent. Meats or vegetables are quickly melted down, as it were, the product always appearing within about an hour as a grayish, pultaceous mass. Next, it passes from the stomach (on the right side, just under the ribs) into a membranous tube, which is thickly studded with glands, each pouring out a fluid peculiar to itself, to combine with the onward moving *ingesta*. At the distance of twelve inches on the route, bile from the liver is added; and then a bland secretion from the pancreas, or sweetbread, which alone, of all others in the system, dissolves butter, oils, and lard, converting them into an emulsion. Millions of tubes, smaller than hairs, open within the tube, sucking up a milky fluid (chyle), the product of the food and the admixtures since it arrived at the stomach. Then it is conveyed by the distal extremities of the lymphatics (the small tubes above mentioned) into a tube the size of a wheat straw. Once in there, it ascends up the whole length of the abdomen through the chest direct. Thence, mixing with impure venous blood, it goes to the right chamber of the heart, and thence is sent into the lungs. By drawing in a breath, the oxygen in the air is united to the new fluid and the returned old blood; it revivifies one and vitalizes the other. From the food, the solid parts of the body are not only made, but kept in repair.

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CEMENTING LEATHER TO METALS.—The leather is painted with a warm extract of nutgalls, the roughened and heated metal is coated with a warm solution of glue, the leather put on and pressed.—*F. Sieburger.*

A SIMPLE WAY FOR CLEANING SILVER.—The water in which peeled potatoes have been boiled, especially after standing, accomplishes the purpose very readily.

ELECTRIC INDICATOR OF VITIATED AIR.—A solution of palladium chloride is so connected with a battery that, as long as no metal is precipitated, no current passes; but as soon as carbon monoxide occurs in the atmosphere, metallic palladium is precipitated, which establishes a current, and rings a bell to give warning of the presence of the noxious gas.—*La Gaceta Industrial.*

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HOME MADE CANDLES.—Many of our readers in the country will find that candles can be made economically, by mixing a little melted beeswax with the tallow to give durability to the candle, and to prevent its "running." The light from a tallow candle can be improved in clearness and brilliancy by using small wicks which have been dipped in spirits of turpentine and thoroughly dried.

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THE amount of paper required to print this week's edition of the SCIENTIFIC AMERICAN.—regular and special—is 21,000 pounds, or ten and a half tuns.

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### Inventions Patented in England by Americans,

[Compiled from the Commissioners of Patents' Journal.]

From October 14 to October 27, 1873, inclusive.

BESSEMER CONVERTER.—J. E. Sherman (of Bucksport, Me.), Norbitos, Eng.
BOOT TACKS.—L. R. Blake, Brooklyn, N. Y.
DRIVING BOOT TACKS.—L. R. Blake, Brooklyn, N. Y.
FRICTION BEARING.—T. A. Weston, Ridgewood, N. J.
IRON MANUFACTURE.—J. E. Sherman (of Bucksport, Me.), Norbitos, Eng.
LIFT AND FORCE PUMP.—W. D. Baxter, New York city.
LOCK WASHER.—K. H. Loomis (of New York city), London, England.
LOOM.—G. Merrill, New York city.
PASSENGER REGISTER.—J. T. Parlour (of Brooklyn, N. Y.), London, Eng.
RAISING MACHINERY.—T. A. Weston, Ridgewood, N. J.
ROTARY ENGINE.—J. D. Bennett, Brooklyn, N. Y.

## Recent American and Foreign Patents.

### Improved Water Wheel.

Gates Curtis, Ogdensburgh, N. Y.—This invention is an improvement in turbines, and relates chiefly to the construction and arrangement of a conet gate ring, which is supported on a bonnet, and arranged with inclined upper and lower rims, which form extensions of the curved rims of the wheel. The chute pads, with the outwardly curved wings and the opening, form the chutes, through which the water is conveyed to the buckets. The gate ring is operated, in the usual manner, by a rack and pinion, for admitting, cutting off, or regulating the flow of water from a thin sheet to its full capacity. The solid chute pads close tightly on the apertures of the bonnet, so that on stopping the wheel, no floating wood or other rubbish may clog the wheel or otherwise obstruct the passage of the water.

### Improved Combined Indicator and Safety Valve.

John Smith, Old Ford, England.—A valve spindle, provided with a ring shoulder, is acted against on its under side by two levers attached to a horizontal spindle, one end of which is supported in a bearing; the other passes through a stuffing box, and has attached to its extremity another lever. By raising the latter lever, the short lever will be brought to act against the under surface of the shoulder, thus raising the hollow spindle and allowing the steam to pass up the same and escape. The whistle is fixed in the side of the chamber and so arranged that it will be sounded only when the spindle is raised by an excess of pressure of steam within the boiler, and not when it is raised by the lever to let off the steam.

### Improved Spark Arrester.

James Hughes, Scranton, Pa.—This invention has for its object to furnish an improved spark arrester for attachment to the smoke stack of locomotive engines, which shall be so constructed as not to obstruct the draft, while preventing the passage of the sparks, and preventing the exhaust from cutting the wire netting. Two ring plates, of exactly the same form and size, are perforated with numerous holes, so arranged that the holes of one ring may be directly over the spaces between the holes in the other ring, so that the draft cannot pass directly through the holes to the netting. Two circular plates, of the same form and size, a little larger than the center openings of the rings, are perforated with numerous holes, and so arranged that the holes of one plate may be opposite the spaces between the holes of the other plate, so that the draft cannot pass directly through. One of the circular plates is rigidly connected with one of the ring plates by rigid arms, so that the said circular plate may be supported from the said ring plate. And by suitable construction the rings and plates may be conveniently adjusted at any desired distance apart.

### Improved Machine for Shaving Leather.

David Y. Haas, Hepler, Pa.—This is a machine designed mainly for the use of harness makers, for shaving straps and pieces of leather to a uniform form thickness. The bed of the machine is provided with two transverse bars which have projecting feet, by means of which the bed may be screwed down to a bench. An adjustable frame is hinged to the bed at two points, and a roller, which is supported on central journals so that it freely revolves, may be removed when the frame is raised. The knife is attached to the top of the frame by the screws. The leather to be shaved is drawn over the roller, under the knife, and the knife is adjusted to cut or shave the leather to the required thickness by adjusting a bar so that it will hold the frame and, consequently, the knife in the right position. A presser bar is attached to springs on the frame to press the leather down upon the roller.

### Improved Toy Propeller.

George W. Jones, Philadelphia, Pa.—This toy propeller is driven by the alternate compression and expansion of an elastic bulb or air receiver, effecting thus the corresponding expulsion and admission of a volume of water from and into a cylinder or chamber located within the hull of the vessel to be propelled.

### Improved Process for Destroying Ants.

John J. Dulany and Henry Dreyer, Oakland, Texas.—This invention relates to means for protecting growing crops, especially cotton, from the ants which are so destructive in some sections of the cotton growing regions. A hole is first made perpendicularly into the main cells with an earth auger, or in any other manner, for ten or fifteen feet. This hole is filled about half full with combustible material. A pipe is then introduced which intersects the hole about in the middle, or from five to seven feet from the surface. After which a poisonous chemical compound of coal, sulphur, tobacco, phosphorus, and cyanide of potassium is prepared. The wood in the perpendicular hole is ignited and at the same time air is forced in with a bellows. When the wood is well burning, the above compound is placed in the hole, which is tightly closed. The gases generated will permeate every part of the ants' habitations, and destroy all animal life.

### Improved Metallic Cornice and Gutter.

John B. Cornell, New York city.—In the application of galvanized sheet iron cornices, gutters, etc., to buildings, it has been the usual practice to employ wooden planks beneath or within any broad surfaces of the sheet metal to give it a bearing throughout its extent and prevent its becoming seriously dented. The use of these wooden planks is, however objectionable on account of danger from fire. This invention consists in the application of a channel iron bed plank, in lieu of the wooden plank or board heretofore used for supporting the lining of gutters, cornices, and roofs, where the outer cover is of sheet metal.

### Improved Balanced Slide Valve.

Joshua Evered, Muskegon, Mich., assignor to himself and Joshua A. Davis, of same place.—On the back of the valve is the cylinder, the outside of which is accurately turned and grooved for a packing ring. To this cylinder is fitted a sleeve which plays freely but steam tight. The top surface of this sleeve slides in contact with the under side of the cover of the steam chest. In the center of the cylinder is a piston, beneath which is a spiral spring, the purpose of which is to force the piston against the sleeve and hold the sleeve up against the steam chest cover when the valve is not under steam pressure. By this construction the pressure is so far taken off the face that the valve works with but slight friction.

### Improved Scissors.

Harry S. Breeden, Barry, Ill.—This invention consists of spring scissors, of which one shank is curved, having no ring the other provided with two rings both being also connected by a pivoted spring latch or lock, which holds the blades together when it is desired to throw them out of use during the handling of the goods. The scissors are used as clippers by placing the rings on the third and little fingers of the hand, applying thumb and forefingers to the blades to clip the selvage of cloth, or the thread in machine sewing.

### Improved Composition for Preserving Dead Bodies.

John M. Gallagher, Carthage, N. Y.—This invention is a disinfectant compound formed of alum, chlorate of potash, corrosive sublimate and alcohol. Cloths are saturated with this liquid and laid upon the face, and may be applied to other parts of the body, and a certain quantity of the liquid is preferably poured into the mouth. Decomposition and decay are thereby arrested.

### Improved Lubricator.

John McLure Power, Port Discovery, Wash. Terr.—The valve at the bottom of the oil holder is formed on the end of a tube which passes up through the cap and is closed at the top, and provided with a collar. The valve is thus held upon its seat by a pressure regulated by screwing the cap up or down. A vertical pipe rises up from the connecting pipe below the valve about as high as the top of the oil chamber, and is attached at the lower end with the steam pipe, by which the steam is admitted to carry the oil down through valve and pipe. This hollow valve tube is thus constituted a condenser for condensing the steam. A glass tube is introduced into the space between sections of connecting pipe, both for use in lubricators and water gages, and secured in thimbles screwed into the enlarged and socketed ends of the sections of the pipe, which are connected together so that the tube is held rightly in the required position and so that it may be packed, if need be, at the ends with washers. Above the glass tube is a short tube traversing it at right angles, with an eye glass in one end, and a light glass in the other for the inspection of vapors within.

## Business and Personal.

**The charge for insertion under this head is $1.50 a line.**

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For Best Upright Drill, Machinist's Tools, and Steam Engines from 3 to 60 H. P., address Hawes Machine Co. Fall River Mass.

Patent Salesmen, and m'frs. of household hardware, see Notice on page 14 signed "Box 40."

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The Palmer Spring Hammer, illustrated on another page received the first premium of a silver medal at the last Fair of the American Institute, just closed. S. C Forsaith & Co., Exhibitors and Manufacturers, Manchester N. H.

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We sell all Chemicals, Metallic, Oxides, and Imported Drugs; also, "Nickel Salts" and Anodes for Plating, with full printed directions on Nickel, in pamphlet form, which we mail, on receipt of fifty cents, free. A Treatise on "Soluble Glass" we mail for $1 also. Orders will receive prompt attention by addressing L. & J. W. Feuchtwanger, 55 Cedar Street, New York.

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Niagara Steam Pump for Mines, Quarries, Tanneries Wrecking and Fire Steamers, Railroad Tanks, Drainage, and Irrigation, Beer, Liquors, Oils, Acids, Hot and Cold Water, etc., Chas. B. Hardick, Brooklyn, N. Y.

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"A Combined Hand and Power Planer," for Machinists. Send for a circular, to Jos. A. Sawyer & Son, Worcester, Mass.

## Notes & Queries

H. N. M. asks: How can I best soften castings of iron? Answer: We know of no better plan than to place the castings, surrounded by saw dust, in an iron box, [illegible] to exclude the air, and subject it to a red heat for several hours. The castings must be cold before they are withdrawn.

M. B. asks: What are the ingredients of vulcanized rubber, and their proportion? Answer: Vulcanization of rubber is effected by combining it with sulphur or the mineral sulphurets. The process is differently conducted in different manufactories. Cloud chone combines with from 12 to 15 per cent of sulphur, and vulcanization can be effected by dissolving the rubber in naphtha, charged with a sufficient quantity of sulphur to become a compound solvent of the rubber, 10 or 12 per cent of its weight of sulphur is then added to the naphtha paste and thoroughly incorporated. The article is then molded into any form required. The temperatures for vulcanization by the common method range from 220° to 330° Fah.

W. T. H. asks: How can I put quicksilver on glass, to make a looking glass? Answer: Place a sheet of tin foil, the size of the glass, upon a perfectly smooth solid marble top table, and carefully rub down all the wrinkles in the metal with a brush, taking care not to break the foil. Then pour over it a small portion of mercury, and rub it over the tin foil gently with a clean piece of very soft woolen stuff. Then pour on as much mercury as it will hold, placing a strip of cloth around the edges to prevent waste, and slide a perfectly clean and dry sheet of glass over the surface of the liquid metal, beginning at one end and ending at the other. Some experience is necessary in sliding the glass, to make a perfect mirror. Afterwards the glass is placed under heavy weights, to remove superfluous mercury.

P. asks: How can I preserve leaves? Answer: Press them between pieces of blotting paper, with a heavy weight, until all the juices are dried out.

F. S. asks: How can I galvanize, or tin, or otherwise make brilliant and rust-proof, a flat polished surface of cast iron? Answer: Dip the plate first into muriate of zinc, and afterwards into a tin bath.

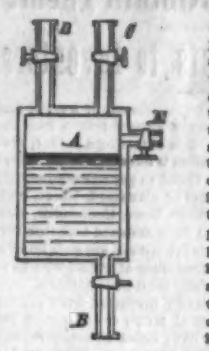
J. A. M. asks: How do electricians calculate the resistance on a telegraph wire, and how do they determine where a rupture has taken place? Who is the best author on the subject? Answer: To ascertain where a break has occurred in a telegraph wire, the charge of electricity which the wire from either station will contain is first measured; and if the charge per mile is known, the amount actually observed will give the distance of the break. A galvanometer is used for this purpose. Consult Noad's "Electricity."

F. H. asks: How can I fasten the glass part of a kerosene lamp to the metal base, so that it will hold? Answer: Take plaster of Paris and make it into a creamy consistency with water and apply to the parts. Avoid using till the plaster is dry, when you will find the part firmly united.

F. E. P. says: In electroplating sewing machine attachments, I find it very difficult to deposit the silver on the solder at the joints. I have tried several dipping compounds, but with poor success. I have tried copper plating; but the copper will not stick firmly enough. Can you give me any information on the subject? Answer. To prepare your articles for plating: first boil them in a solution of caustic potash to free them from grease. Then dip quickly in red nitrous acid to remove any oxide from the surface, and afterwards wash well to remove every trace of acid. Then dip into a solution of mercury in cyanide of potassium (not too long), and afterwards wash in water as before. The amalgamation of the surface effected promotes the adhesion of the film of silver.

M. A. P. asks: What can I use to cement the joints of vitrified pipe for conveying strong acetic acid? Answer: Mix equal parts of pitch, resin, and well dried plaster of Paris. This is used for the masonry of chlorine chambers and vitriol works.

T. L. B. asks: How can I supply a small boiler with water by the direct pressure of steam? Answer: Use an arrangement like an equilibrium oil cup.



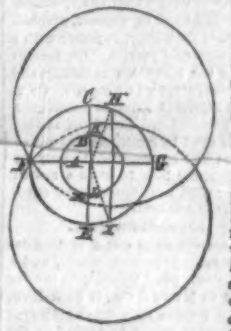

The appended sketch will probably enable you to understand the arrangement. A is a vessel of suitable size, connected by a pipe, B, to the check valve of the boiler, by C to the steam space, and by D to the water supply—each of these pipes having a cock or valve, so that it can be closed at pleasure. E is an escape pipe and valve, opening into the air. The operation is as follows: Close valves in pipes B and C, and open those in pipes D and E. The water will then run into the vessel A. When it is full, close valves in pipes D and E and open valves in pipes B and C. The vessel A being above the boiler, the water will run into the boiler, as the steam pressure on top of the water in A is the same as the pressure on top of the water in the boiler.

A. M. asks: How can I get iron out of dipping acid (nitric and sulphuric) which has accidentally been dissolved in it? It gives the brass articles a dull color when dipped in it. Answer: If the mixed acids are not too strong, you can precipitate the iron as prussian blue by the addition of dilute solution of yellow prussiate of potash (ferrocyanide of potassium). Add the yellow prussiate solution by degrees, stirring well until a blue color ceases to be formed, and then allow to settle. Pour off the acid from the precipitate.

A. B. asks: How can I dissolve rubber so as to mold it into any required form? Answer: Immerse the rubber in a mixture of bisulphuret of carbon 95 parts, and rectified spirit 5 parts, until it swells into a pasty mass. It may then be molded into any desired form.

H. D. asks for a formula for bay rum. Answer: Tincture bay leaves 5 ozs., otto of bay 1 dram, bicarbonate of ammonia 1 oz., borax 1 oz., rose water 1 quart. Mix and filter. Bay rum is said to be made in the West Indies by distilling rum with the leaves of the bay tree.

H. R., S. H., and H. C. say: Locomotive eccentrics sometimes slip round upon the shaft. How can we determine their right positions, in setting them? Answer: Let F G and E C be two straight lines at right angles to each other, the circle described with A D as a radius be the end view of the shaft, the circle described with A C as a radius be the circle described by the center of the eccentrics, and H I the line parallel to E C, and distant from it the amount of the lap and lead. Then if F G represents the direction of the crank when on the center, H and I will be the positions of the centers of the eccentrics, according to the rule. If, then, the points K and L, in which the lines A H and A I intersect the circle representing the shaft, be transferred to the shaft, by laying off on its end the two diameters and the chords, B K and L M, the eccentrics can readily be set.




A. B. K. asks: 1. What is used to give imported pickles their agreeable flavor? 2. Is there anything that will prevent the icing of cakes from rapidly turning yellow? 3. What is used to prepare the sugar for molding for ornamenting? Answers: Wash your vegetables and fruit in cold spring water, and steep for some days in strong brine; drain, dry, and put in jars, add the spice, if required, and fill up with hot, strong, pickling vinegar; cork up tight, and tie over with bladder. When the jars are cold, seal over the corks with sealing wax. The ordinary difficulty is with the vinegar. It is useless to try to make good pickles with sour cider. Use a malt vinegar, if you can get it. 2 and 3. Beat the white of eggs to a full froth, with a little rose water: add gradually as much finely powdered sugar as will make it thick enough, beating it all the time. Use vegetable coloring matter for the ornaments. This ought not to become rapidly discolored, if the sugar is pure.

H. F. asks: Are there three rails used on the track of the Rigi railway? Answer: Yes, and the central rail is a rack into which a toothed wheel of the locomotive gears.

T. H. asks: What is an anemometer? Answer: An instrument for measuring the velocity of the wind. It is usually formed of two wires crossing at right angles, at each end of which is a cup-shaped vane, placed with its concave side to receive the current. A counter is employed to register the number of its rotations; and it must be nearly free from friction, or its indications will be valueless.

J. H. M. asks: Can you give me a recipe for staining butternut wood in imitation of black walnut? Answer: The following is highly recommended: Water 1 quart, washing soda 1½ ozs., Vandyke brown 2½ ozs., bichromate of potash ½ oz. Boil for 10 minutes and apply with a brush.

[OFFICIAL.]

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## APLLICATIONS FOR EXTENSIONS.

Applications have been duly filed and are now pending for the extension of the following Letters Patent. Hearings upon the respective applications are appointed for the days hereinafter mentioned:

27,022.—ENGINE EXHAUST PIPE.—G. Edwards. Jan. 14.
27,023.—CALENDAR CLOCK.—E. M. Mix *et al.* Jan. 14.
27,034.—HARVESTER.—J. Butler. Jan. 21.
27,319.—BENDING SHEET METAL.—O. W. Stow. Feb. 11.

## EXTENSIONS GRANTED.

25,986.—CUT-OFF VALVE.—E. R. Arnold.
25,975.—TACKLE BLOCK.—I. P. Palmer.
25,984.—BIT BRACE.—N. Spofford.
26,008.—TELEGRAPHIC MACHINE.—G. M. Phelps.

## DESIGNS PATENTED.

6,966.—TOY TARGET.—S. Hamm, Philadelphia, Pa.
6,967.—SPOON HANDLE.—B. D. Bolderhase, New York city.
6,968.—FLY TRAP.—D. K. Thompson, Clark, Pa.
6,969.—SPOON, ETC.—G. Wilkinson, Providence, R. I.

## TRADE MARKS REGISTERED.

1,311.—SHINGLES.—J. M. M. Biskely, New York city.
1,312.—FLOUR.—Hazall & Co., Richmond, Va.
1,313.—FLOUR.—Hazall & Co., Richmond, Va.
1,314.—FISH.—Ocean Trout Co., Port Monmouth, N. J.
1,315.—GLASS SHADES, ETC.—S. J. Pardessus & Co., N. Y.

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## Practical Hints to Inventors.

PROBABLY no investment of a small sum of money brings a greater return than the expense incurred in obtaining a patent, even when the invention is but a small one. Large inventions are found to pay correspondingly well. The names of Blanchard, Morse, Bigelow, Colt, Ericsson, Howe, McCormick, Hoe and others, who have amassed immense fortunes from their inventions, are well known. And there are thousands of others who have realized large sums from their patents.

More than FIFTY THOUSAND inventors have availed themselves of the services of MUNN & Co. during the TWENTY-SIX years they have acted as solicitors and Publishers of the SCIENTIFIC AMERICAN. They stand at the head in this class of business; and their large corps of assistants, mostly selected from the ranks of the Patent Office: men capable of rendering the best service to the inventor, from the experience practically obtained while examiners in the Patent Office: enables MUNN & Co. to do everything appertaining to patents BETTER and CHEAPER than any other reliable agency.

### HOW TO OBTAIN PATENTS

This is the closing inquiry in nearly every letter, describing some invention which comes to this office. A *positive* answer can only be had by presenting a complete application for a patent to the Commissioner of Patents. An application consists of a Model, Drawings, Petition, Oath, and full Specification. Various official rules and formalities must also be observed. The efforts of the inventor to do all this business himself are generally without success. After great perplexity and delay, he is usually glad to seek the aid of persons experienced in patent business, and have all the work done over again. The best plan is to solicit proper advice at the beginning. If the parties consulted are honorable men, the inventor may safely confide his ideas to them; they will advise whether the improvement is probably patentable, and will give him all the directions needful to protect his rights.

### How Can I Best Secure My Invention?

This is an inquiry which one inventor naturally asks another, who has had some experience in obtaining patents. His answer generally is as follows, and correct:

Construct a neat model, not over a foot in any dimension—smaller if possible—and send by express, prepaid, addressed to MUNN & Co., 37 Park Row, together with a description of its operation and merits. On receipt thereof, they will examine the invention carefully, and advise you as to its patentability, free of charge. Or, if you have not time, or the means at hand, to construct a model, make as good a pen and ink sketch of the improvement as possible and send by mail. An answer as to the prospect of a patent will be received, usually, by return of mail. It is sometimes best to have a search made at the Patent Office; such a measure often saves the cost of an application for a patent.

### Preliminary Examination.

In order to have such search, make out a written description of the invention, in your own words, and a pencil, or pen and ink, sketch. Send these, with the fee of $5, by mail, addressed to MUNN & Co., 37 Park Row, and in due time you will receive an acknowledgment thereof, followed by a written report in regard to the patentability of your improvement. This special search is made with great care, among the models and patents at Washington, to ascertain whether the improvement presented is patentable.

### To Make an Application for a Patent,

The applicant for a patent should furnish a model of his invention if susceptible of one, although sometimes it may be dispensed with; or, if the invention be a chemical production, he must furnish samples of the ingredients of which his composition consists. These should be securely packed, the inventor's name marked on them, and sent by express, prepaid. Small models, from a distance, can often be sent cheaper by mail. The safest way to remit money is by a draft, or postal order, on New York, payable to the order of MUNN & Co. Persons who live in remote parts of the country can usually purchase drafts from their merchants on their New York correspondents.

### Foreign Patents.

The population of Great Britain is 31,000,000; of France, 37,000,000; Belgium, 5,000,000; Austria, 36,000,000; Prussia, 40,000,000, and Russia, 70,000,000. Patents may be secured by American citizens in all of these countries. Now is the time, when business is dull at home, to take advantage of these immense foreign fields. Mechanical improvements of all kinds are always in demand in Europe. There will never be a better time than the present to take patents abroad. We have reliable business connections with the principal capitals of Europe. A large share of all the patents secured in foreign countries by Americans are obtained through our Agency. Address MUNN & Co., 37 Park Row, New York. Circulars with full information on foreign patents, furnished free.

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Rejected cases, or defective papers, remodeled for parties who have made applications for themselves, or through other agents. Terms moderate. Address MUNN & Co., stating particulars.

### Reissues.

A reissue is granted to the original patentee, his heirs, or the assignees of the entire interest, when, by reason of an insufficient or defective specification, the original patent is invalid, provided the error has arisen from inadvertence, accident, or mistake, without any fraudulent or deceptive intention.

A patentee may, at his option, have in his reissue a separate patent for each distinct part of the invention comprehended in his original application by paying the required fee in each case, and complying with the other requirements of the law, as in original applications. Address MUNN & Co., 37 Park Row, New York, for full particulars.

### Caveats.

Persons desiring to file a caveat can have the papers prepared in the shortest time, by sending a sketch and description of the invention. The Government fee for a caveat is $10. A pamphlet of advice regarding applications for patents and caveats is furnished gratis, on application by mail. Address MUNN & Co. 37 Park Row, New York.

### Value of Extended Patents.

Did patentees realize the fact that their inventions are likely to be more productive of profit during the seven years of extension than the first full term for which their patents were granted, we think more would avail themselves of the extension privilege. Patents granted prior to 1861 may be extended for seven years, for the benefit of the inventor, or of his heirs in case of the decease of fomer, by due application to the Patent Office, ninety days before the termination of the patent. The extended time inures to the benefit of the inventor, the assignees under the first term having no rights under the extension except by special agreement. The Government fee for an extension is $100, and it is necessary that good professional service be obtained to conduct the business before the Patent Office. Full information as to extensions may be had by addressing MUNN & Co. 37 Park Row, New York.

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Any person or firm domiciled in the United States, or any firm or corporation residing in any foreign country where similar privileges are extended to citizens of the United States, may register their designs and obtain protection. This is very important to manufacturers in this country, and equally so to foreigners. For full particulars address MUNN & Co., 37 Park Row, New York.

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Persons desiring any patent issued from 1836 to November 26, 1867, can be supplied with official copies at a reasonable cost, the price depending upon the extent of drawings and length of specification.

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MUNN & Co. will be happy to see inventors in person, at their office, or to advise them by letter. In all cases they may expect an *honest opinion*. For such consultations, opinions, and advice, *no charge is made*. Write plain; do not use pencil or pale ink; be brief.

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[Specially reported for the Scientific American.]

## CANADIAN PATENTS.

LIST OF PATENTS GRANTED IN CANADA FOR THE WEEK ENDING NOVEMBER 14, 1873.

2,841.—J. M. Killin, Pittsburgh, Pa., U. S. Improvement on molder's gates or sprues, called "Killin's Molders' Gate." Dated Nov. 13, 1873.

2,842.—O. Sherwood, Jr., Brome township, P. Q. Machine for coupling railway cars, called "Sherwood's Self Railway Car Coupler." Nov. 13, 1873.

2,843.—D. DeCastro, of Mortlake, Surrey county, Eng., and R. Burton, Camden town, Middlesex county, Eng. Improvement on gas meters, called "The Imperial Compensating Wet Gas Meter." Nov. 13, 1873.

2,844.—W. A. Telling and Samuel Johnson, Wood Green, Middlesex county, Eng. Improvement on gas meters, called "The Imperial Dry Gas Meter." Nov. 13, 1873.

2,845.—J. Brunet and L. Bellefeuille, Montreal, P. Q. *Machine a presser la tourbe*, called "*Machine a Presser La Tourbe de Brunet et Bellefeuille.*" "Machine for pressing peat." Nov. 13, 1873.

2,846.—J. K. Home, Almonte, Lanark county, P. Q. Improvements on patterns for pipe elbows, describing the swift to form miter joints of elbow pipes at various angles, called "J. H. Holmes' Patterns for Pipe Elbows." Nov. 13, 1873.

2,847.—D. C. Baker, Fulton, N. Y., U. S. Improvement on cultivators, called "Baker's Cultivator." Nov. 13, 1873.

2,848.—D. C. Baker, Fulton, N. Y., U. S. Bolt holders for railroad rails, called "Baker's Railroad Bolt Holder." Nov. 13, 1873.

2,849.—S. Rue, Philadelphia, U. S. Improvements on injectors for steam generators, called "Rue's Little Giant Injector." Nov. 13, 1873.

2,850.—J. W. Stockwell, Portland, U. S. Machine for the manufacture of cement pipe, called "Stockwell's Cement Pipe Machine." Nov. 13, 1873.

2,851.—J. W. Stockwell, Portland, U. S. Improvements in mixing machines, called "Stockwell's Improved Mixing Machine." Nov. 13, 1873.

2,852.—S. B. Munson, Jr., Chicago, U. S. Improvements on fireproof shutters, called "Munson's Fireproof Shutter." Nov. 13, 1873.

2,853.—G. W. Cottingham, St. Mary's, Texas, U. S. Machine for ironing clothes, called "Cottingham's Ironing Machine." Nov. 13, 1873.

2,854.—H. Bolton, Bruntford, Ontario. Improvements on piano stools, called "Improved Double Adjustable Piano Stool Back." Nov. 13, 1873.

2,855.—H. Spear, Elizabeth, Cumberland county, Maine, U. S. Improvements on pumps, called "Spear's Pump." Nov. 13, 1873.

2,856.—N. C. Locke, Salem, Mass., U. S. Improvements on pressure regulators for steam or water, called "Locke's Pressure Regulator for Steam or Water." Nov. 13, 1873.

2,857.—M. Merrick, Oswego, U. S., assignee of H. Tilden, Philadelphia, U. S. Improvements on gas machine, called "Tilden's Improved Gas Machine." Nov. 14, 1873.

2,858.—Ed. Beanes, Toronto, Ontario. Extension of Patent No. 841, for improvements in brewing. Nov. 14, 1873.

2,859.—G. Borden, White Plains, N. Y., U. S., and J. G. Borden, South East, Putnam county, N. Y., U. S. Improvements on the manufacture or product of condensed milk, called "Borden's Manufacture or Product of Condensed Milk." Nov. 14, 1873.

2,860.—G. Borden, White Plains, N. Y., U. S., and J. G. Borden, South East, Putnam county, N. Y., U. S. Process of preserving and condensing milk, called "Borden's Process for Preserving and Condensing Milk." Nov. 14, 1873.

2,861.—W. G. Dunn, Hamilton, Ontario. Movable self feed attachment for coal cooking stoves, called "Dunn's Removable Self-feeding Attachment for Cooking Stoves." Nov. 14, 1873.


## HOW TO OBTAIN

# Patents and Caveats

## *IN CANADA.*

PATENTS are now granted to inventors in Canada, without distinction as to the nationality of the applicant. The proceedings to obtain patents in Canada are nearly the same as in the United States. The applicant is required to furnish a model, with specification and drawings in duplicate. It is also necessary for him to sign and make affidavit to the originality of the invention.

The total expense, in ordinary cases, to apply for a Canadian patent, is $75, U. S. currency. This includes the government fees for the first five years, and also our (Munn & Co.'s) charges for preparing drawings, specifications and papers, and attending to the entire business. The holder of the patent is entitled to two extensions of the patent, each for five years, making fifteen years in all.

If the inventor assigns the patent, the assignee enjoys all the rights of the inventor.

A small working model must be furnished, made to any convenient scale. The dimensions of the model should not exceed twelve inches.

If the invention consists of a composition of matter, samples of the composition, and also of the several ingredients, must be furnished.

Persons who desire to apply for patents in Canada are requested to send to us (MUNN & Co.), by express, a model with a description, in their own language, showing the merits and operation of the invention, remitting also the fees as above for such term for the patent as they may elect. We will then immediately prepare the drawings and specification, and send the latter to the applicant for his examination, signature, and affidavit. It requires from four to twelve weeks' time, after completion of the papers, to obtain the decision of the Canadian Patent Office. Remit the fees by check, draft, or postal order. Do not send the money in the box with model. Give us your name in full, middle name included

Inventions that have already been patented in the United States for not more than one year may also be patented in Canada.

On filing an application for a Canadian patent, the Commissioner causes an examination as to the novelty and utility of the invention. If found lacking in any of these particulars, the application will be rejected, in which case no portion of the fees paid will be returned to the applicant.

Inventors may temporarily secure their improvements in Canada by filing *caveats;* expense thereof, $35 in full.

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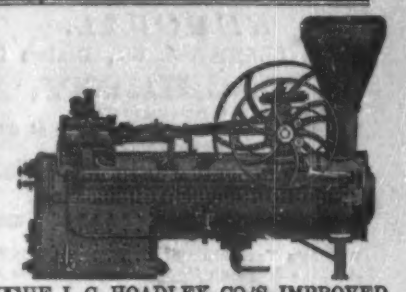

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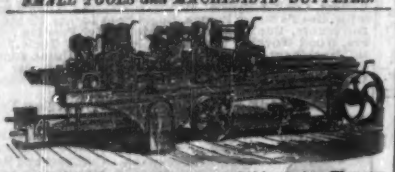

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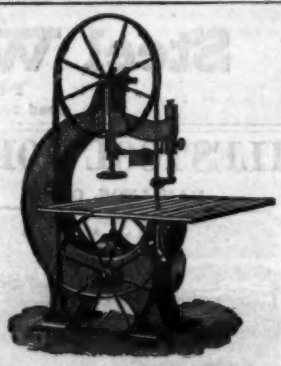

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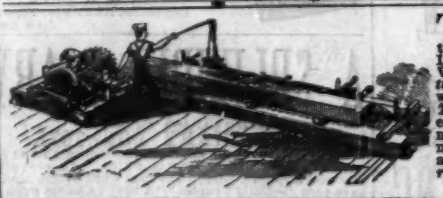

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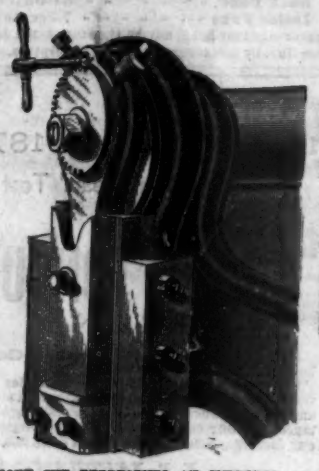

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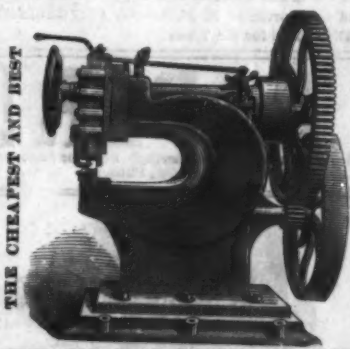


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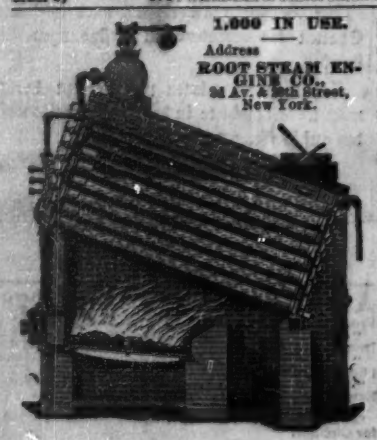

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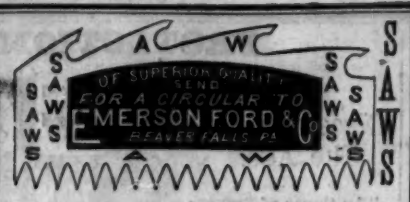


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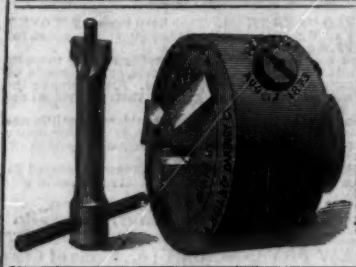

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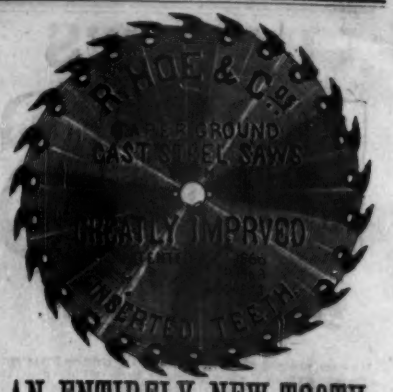


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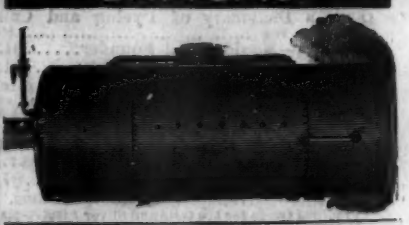

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